OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

FEBRUARY 6, 1950
VOLUME 39, NO. 3

AMERICAN DYESTUFF REPORTER

DEVOTED TO TEXTILE CHEMISTRY • BLEACHING • DYEING • PRINTING • FINISHING

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Only after long and painstaking scientific research was MITIN developed by Geigy chemists. And only after exhaustive tests, scientifically controlled, was it released for general use. Geigy made *sure* that every claim made for the product was an understatement rather than an overstatement.

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Again, to be sure MITIN is properly applied for maximum performance Geigy is making periodic tests, on a regular schedule, of mill-run samples of all who use MITIN. Tests are carried out by Geigy analytical chemists and entomologists at 62 West 2nd Street—our ultra-modern laboratory in Bayonne, N. J.

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62 West 2nd Street and Geigy Dyehouse Technicians serve the mill from the preliminary tests right through to the periodic checking of mill runs, all in the interest of sustaining the mill in the labeling of its products and the zealous guarding of the mill's good will.

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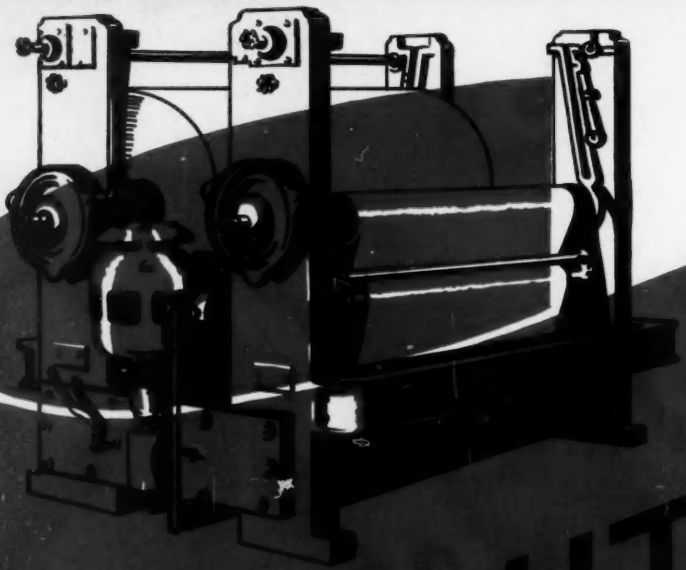

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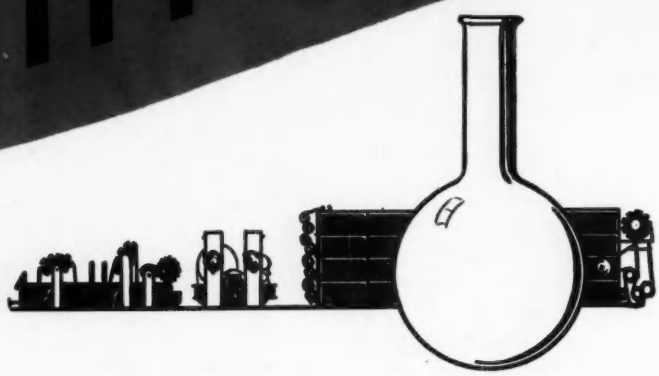

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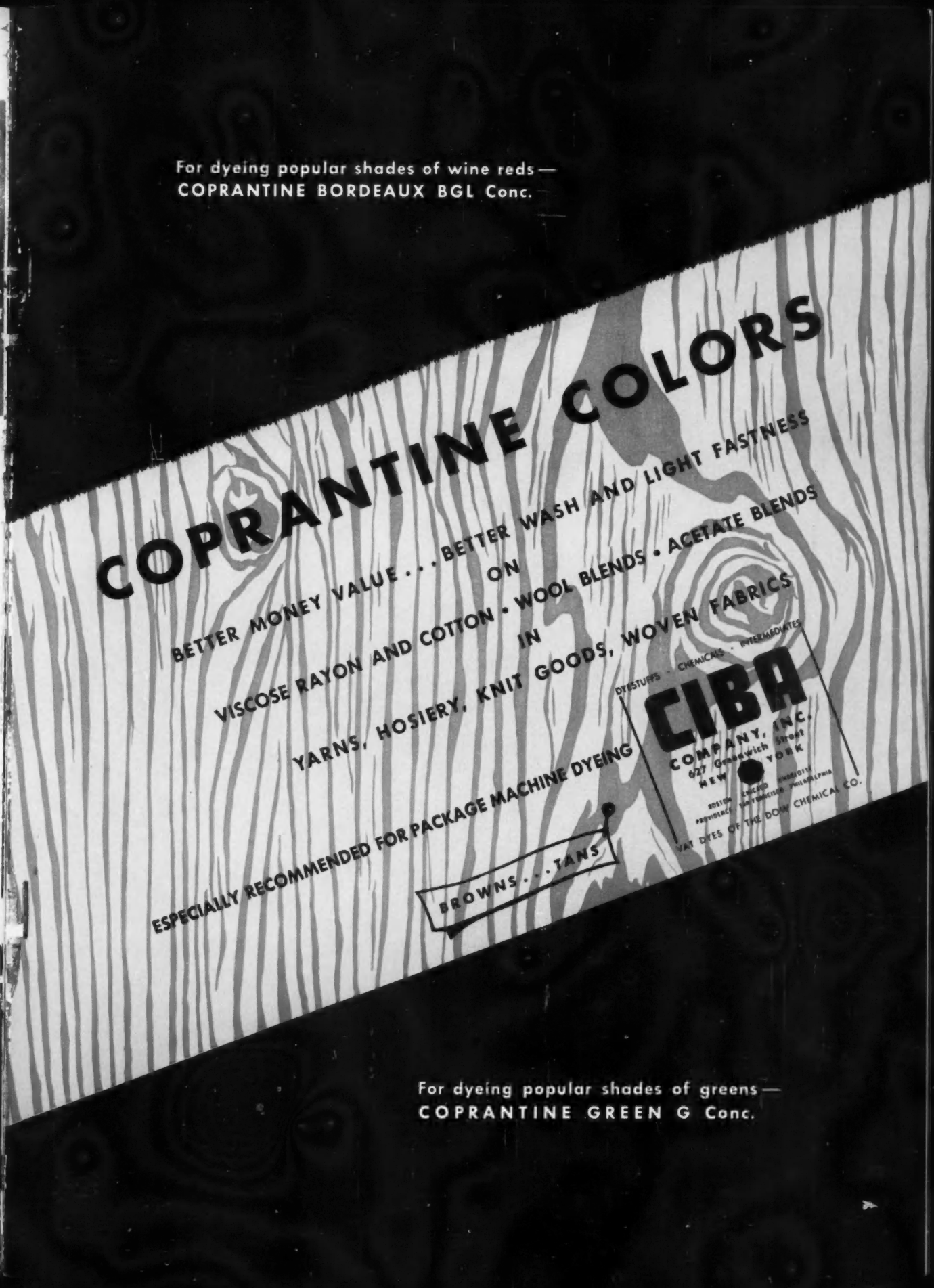
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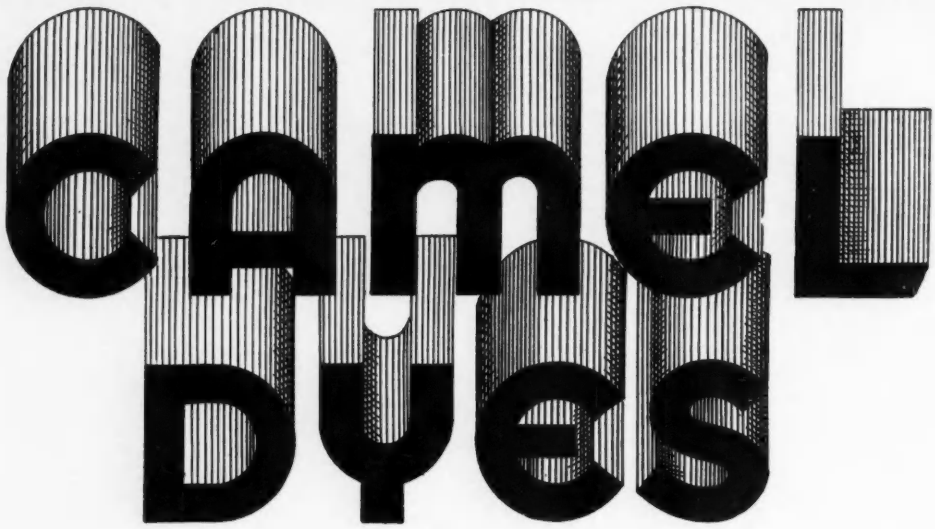

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American Dyestuff Reporter, Vol. 39, No. 3, February 6, 1950. Published every other Monday. Copyright 1950, by Howes Publishing Co., Inc., One Madison Ave., New York 10, N. Y. Domestic subscription, $5.00; Canadian, $6.00. Foreign, $10.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879

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RIPPLE FLO TENTER*

for all-purpose drying, shrinkage control, resin finishes, water repellents, permanent finishes

Here is Butterworth's remarkable new overfeed pin tenter complete with photoelectric eye, amazingly precise control of overfeed and a practical operating speed of 100 yards per minute.

Two years in development . . . thoroughly proven in mill operation, the Butterworth Ripple-Flo Tenter is ready to go to work for you on all-purpose drying, shrinkage control, resin finishes, water repellents, permanent finishes. Check these outstanding advantages:

(1) Overfeed accurately controlled from 0 to 25%

(2) Selvage tolerance of 1/16-inch (plus or minus) in relation to the pin line

(3) Extremely simple in operation

Overfeed is accomplished with overdriven feed rolls ahead of the tenter brushes. A dial indicator calibrated in per cent of overfeed makes accurate setting a simple matter. Bow is kept to a minimum because the entire width of the material is under positive control up to the brushes.

In the new Ripple-Flo Tenter, rail guiders are actuated by a photoelectric beam on the selvage line. Electronic circuits operate instantaneously to keep tenter pin line in register with the selvage. No mechanical fingers to curl or distort the cloth. This control operates as well on light materials as on heavy ones. Cloth color is of little or no consequence . . . and even material with an open selvage construction is handled successfully.

The Ripple-Flo Tenter has been used successfully on mixed fabrics, viscose and acetate rayon, worsteds and laces. Let us give you full details.

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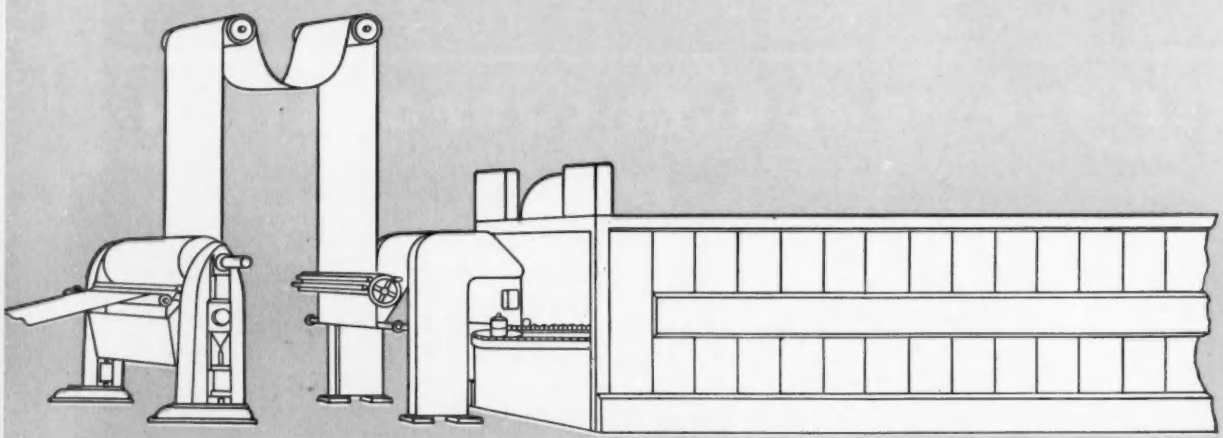
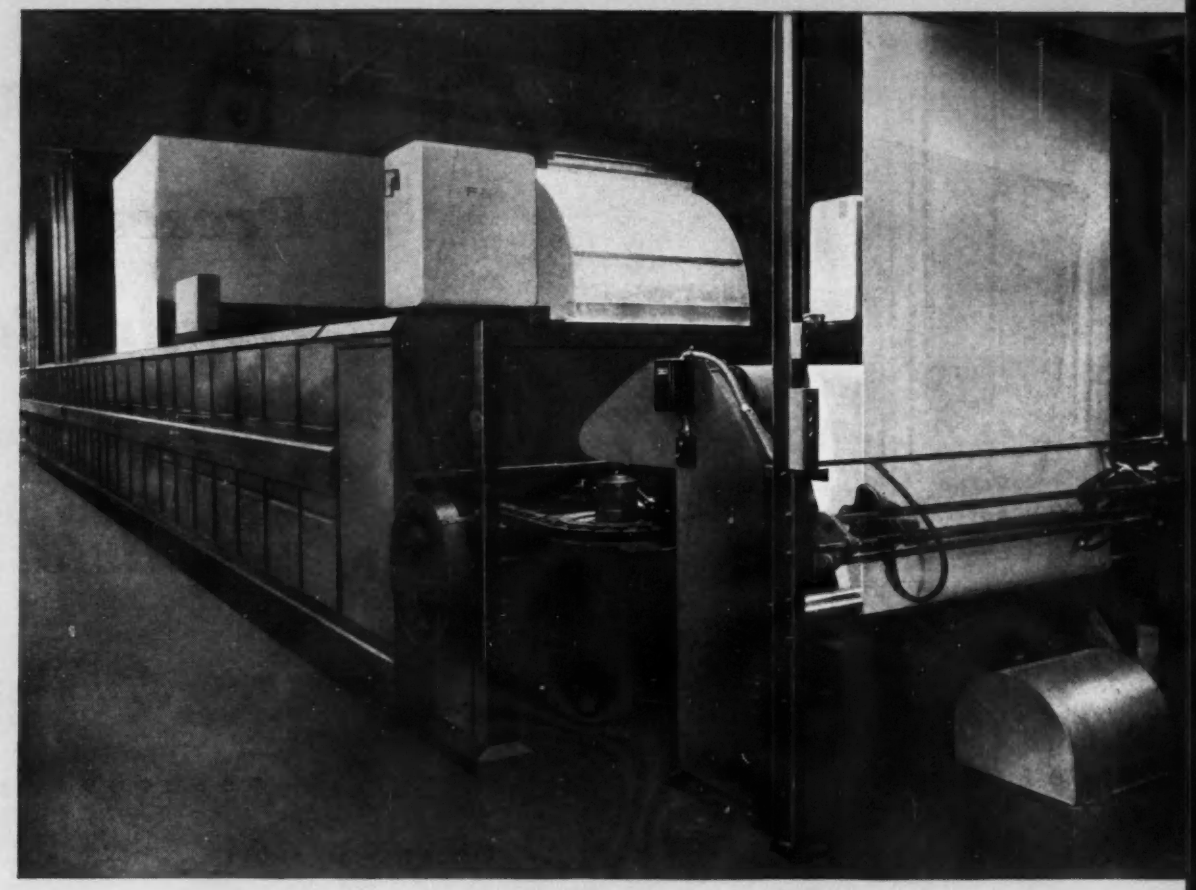
*Patent applied for; Registered trade name

See the Ripple-Flo Tenter
in operation at the
American Textile Machinery Exhibition
Atlantic City, May 8-12



Butterworth Ripple-Flo Tenter Range consists of a 2-roll Padder, sensitive automatic control



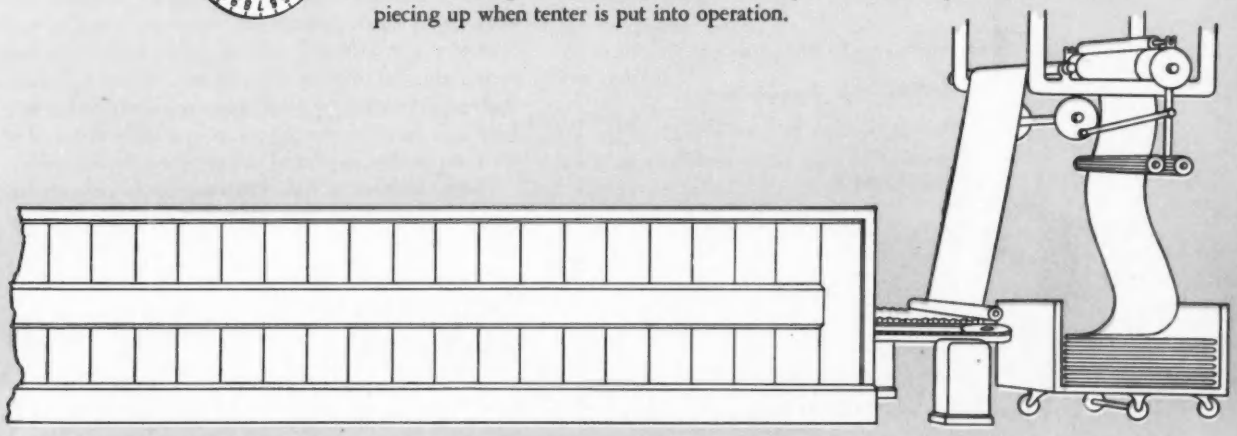
End view showing Overfeed Device in Ripple-Flo Tenter Range.

"MICRO-EYE" SIDE REGISTER CONTROL

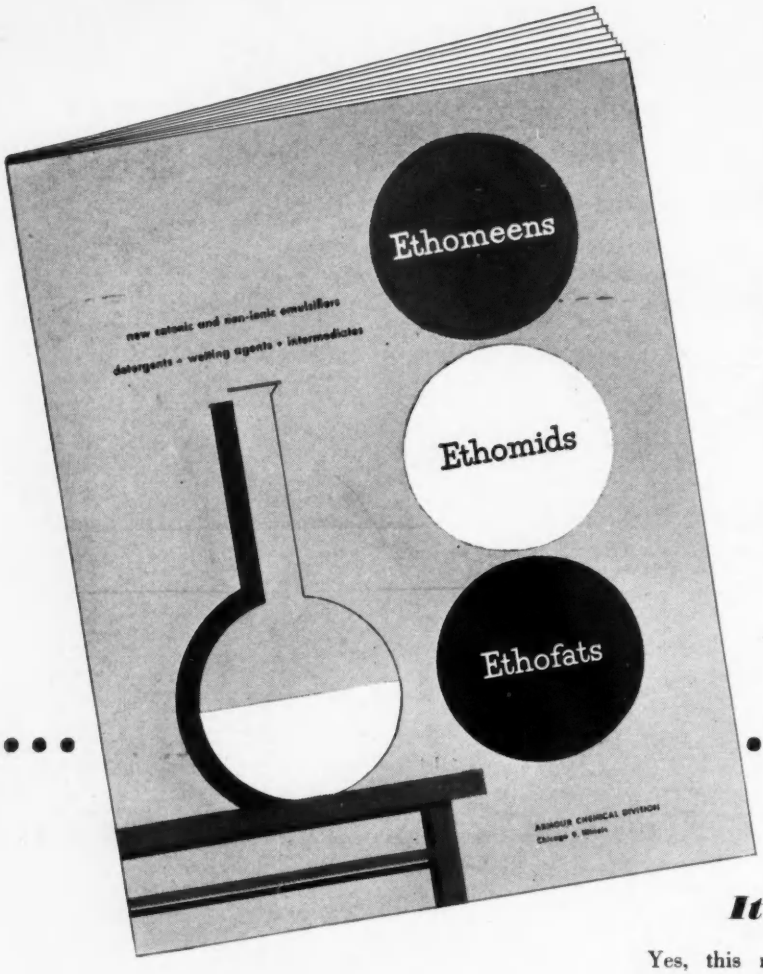
Keeps selvage in proper position automatically. The signal from the scanning head is amplified and actuates a sequence of electronic circuits which, through a motor and lead screw, maintains selvage tolerance of 1/16-inch (plus or minus) in relation to the pin line.

CONTROLLED OVERFEED

Overdriven feed rolls ahead of tenter brushes are driven in conjunction with tenter drive by a patented selsyn system to give perfect coordination at all speeds. Roll overfeed is adjustable. Special brush construction picks up any selvage that comes off the pins at an irregular seam and puts it back on pin line. Facilitates piecing up when tenter is put into operation.



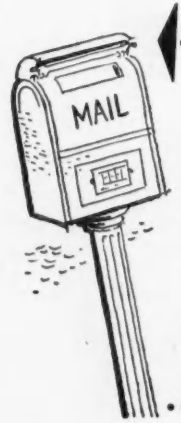
between Padder and Overfeed Unit, Overfeed Device with photoelectric eye, Tenter, and Folder.



Prescribed reading for research chemists

Table of contents includes:

Surface Active Agents . . . Ethomeens vs. Ethomids vs. Ethofats . . . Explanation of Anionic, Non-Ionic, Cationic . . . Chemical Properties of Etho-Chemicals . . . Composition of Etho-Chemicals . . . Surface Tension Lowering . . . Wetting Action . . . Solubility Charts (showing solubility of Etho-Chemicals in Stoddard Solvent, Benzene, Carbon Tetrachloride, Dioxane, Acetone, Isopropanol, Water) . . . Surface Activity in Acid or Alkaline Solutions . . . Emulsification Coupling Agents . . . Industrial Applications of Etho-Chemicals (Formulas are suggested for many specific applications).



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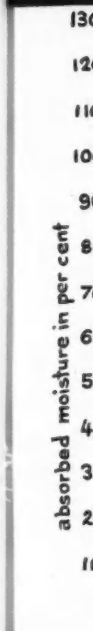
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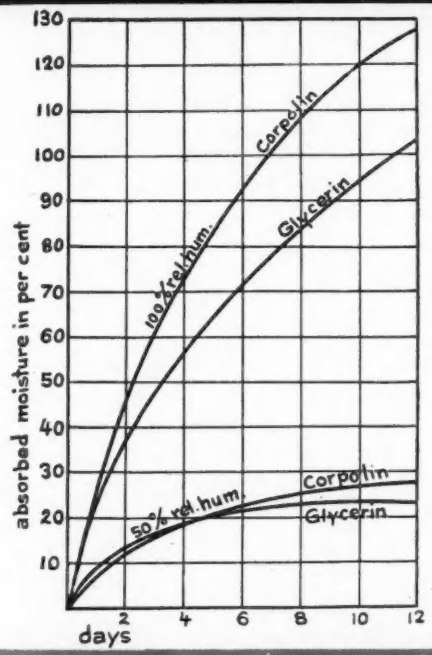

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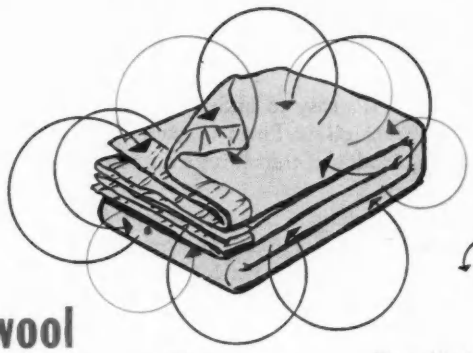

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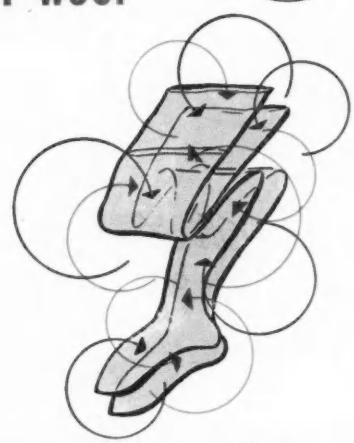

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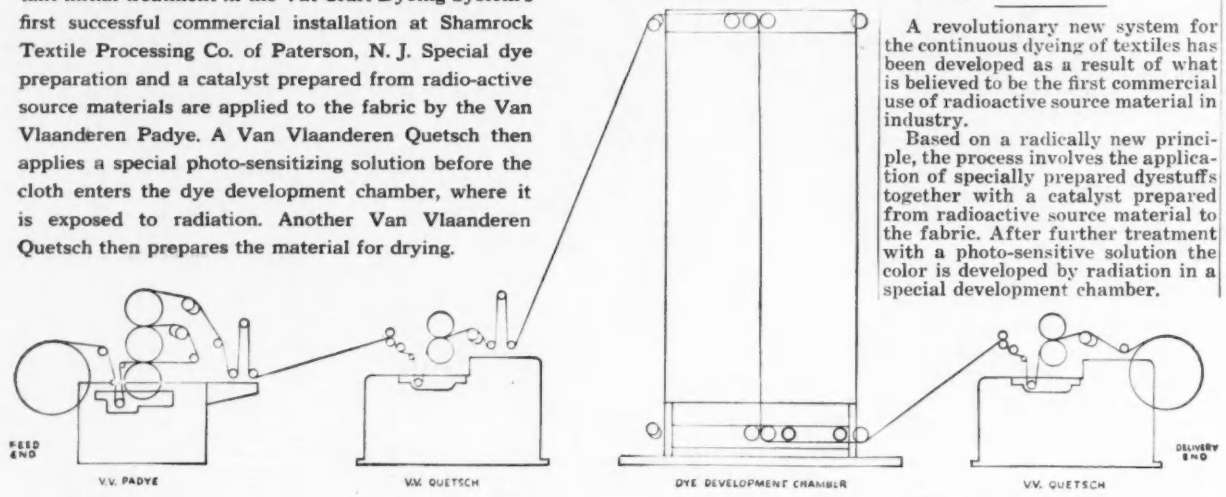
Schematic drawing below of the Vat-Craft System showing how Van Vlaanderen equipment is used.



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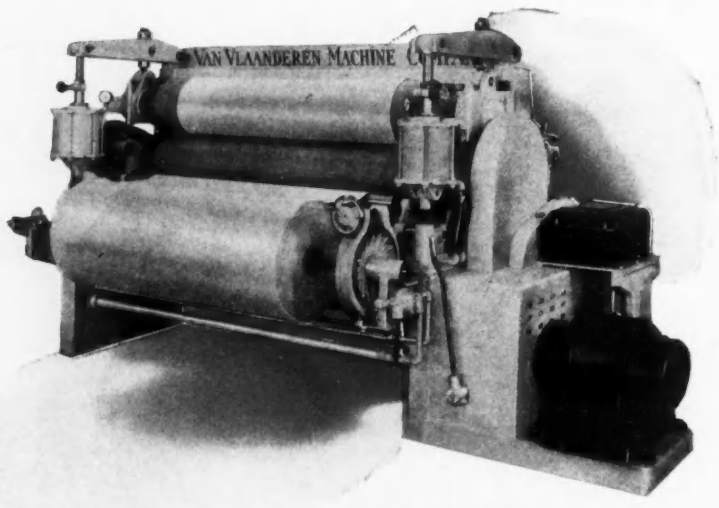

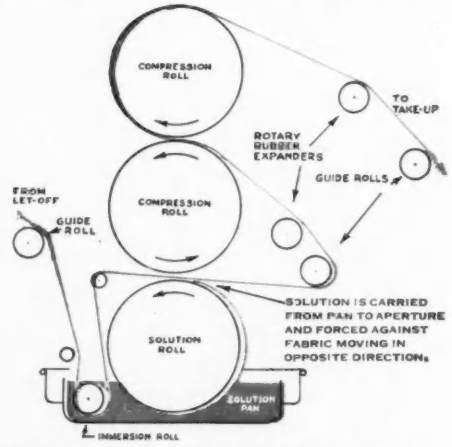

Shown above is the principle of operation of the Van Vlaanderen Padye. Notice how solution is carried from pan and forced into the goods by the bottom roll which revolves in the opposite direction to the travel of the cloth.

SUPERIOR PENETRATION

is provided by the Van Vlaanderen Padye because of its design. Here's why it is different and better. The bottom roll is driven independently and variably in a direction opposite to the travel of the goods. This carries solution from the pan into the aperture. Through centrifugal force and the momentum imparted to the solution carried by the roll it is forced into every fiber as the goods pass in an opposite direction through the restricted space between rolls. ¶ After penetration of the cloth by the solution the goods pass between compression rolls for further penetration and removal of excess liquid. ¶ The Van Vlaanderen Quetsches shown in the diagram above are heavy-duty in every way, with pressure up to three tons.

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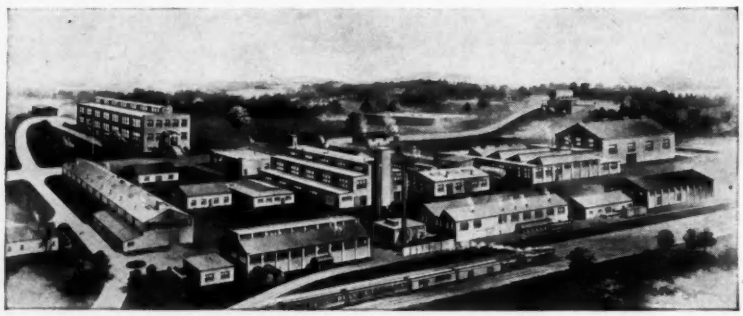

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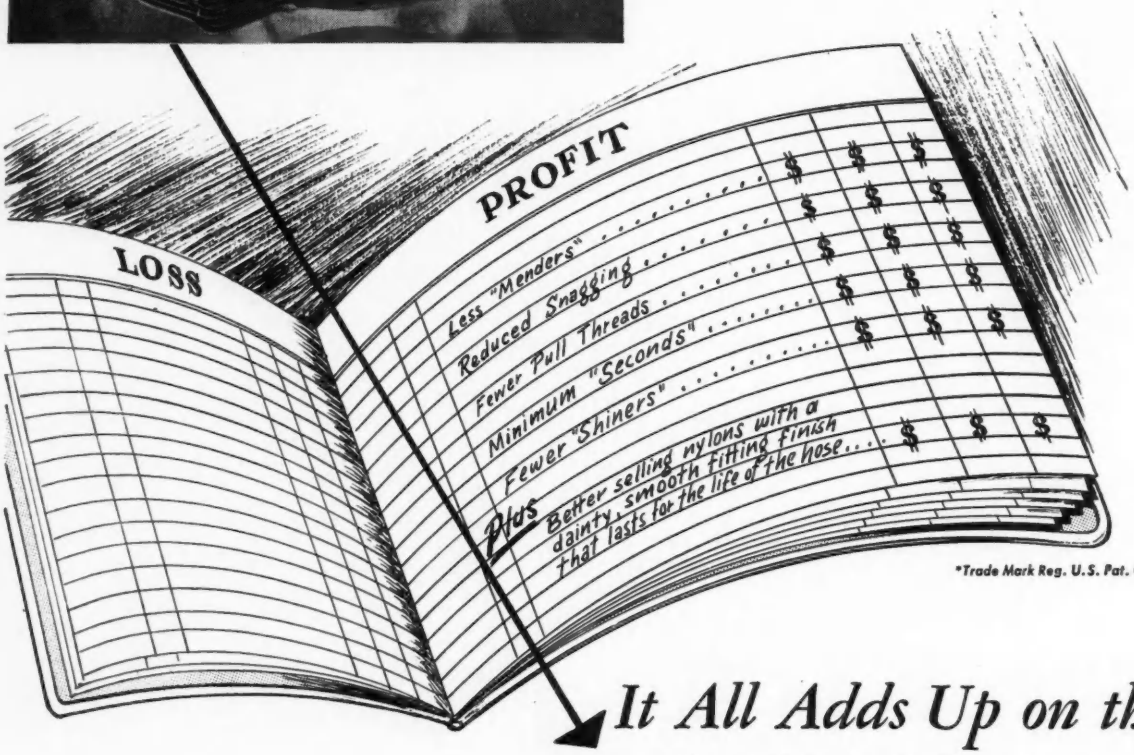

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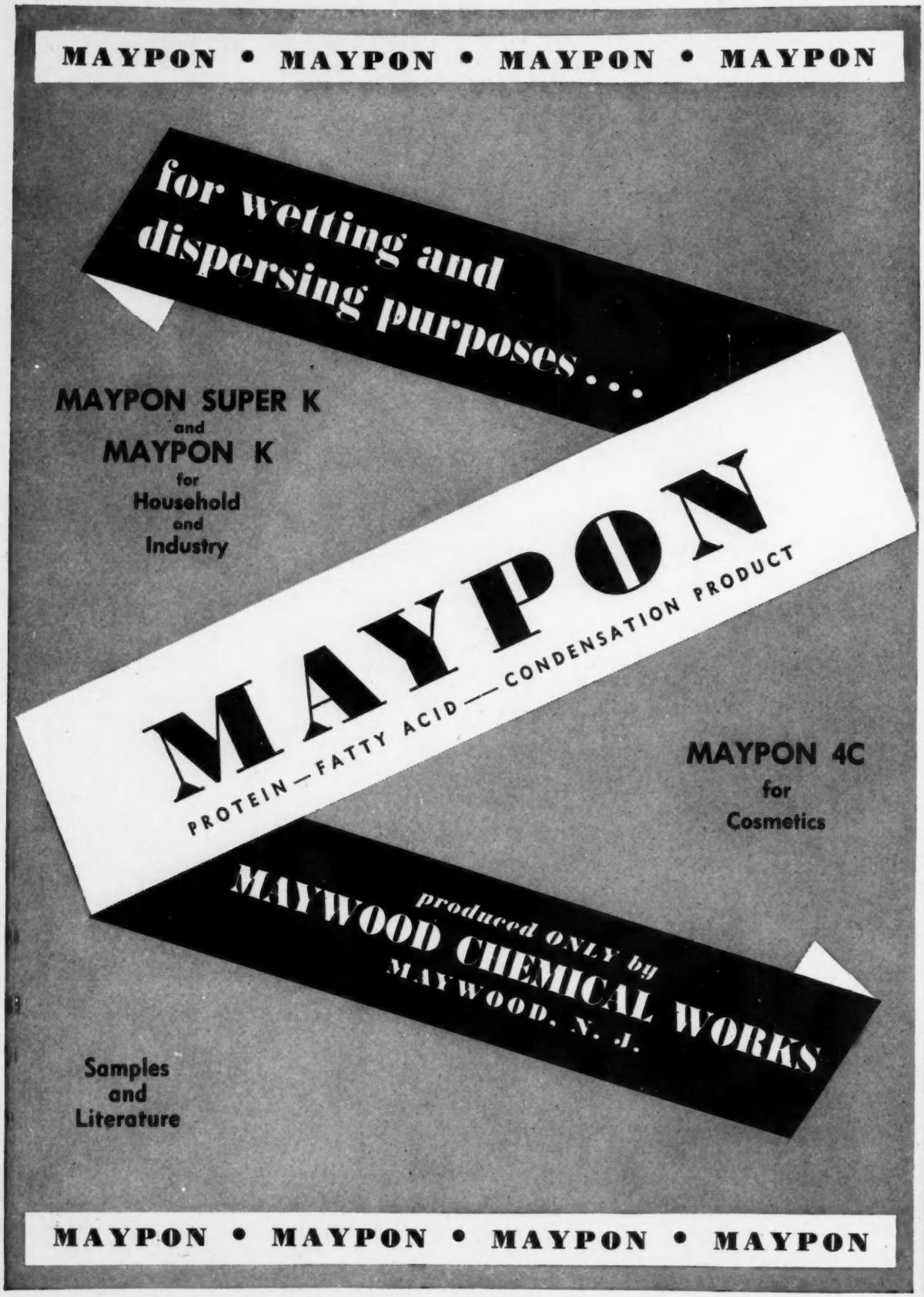
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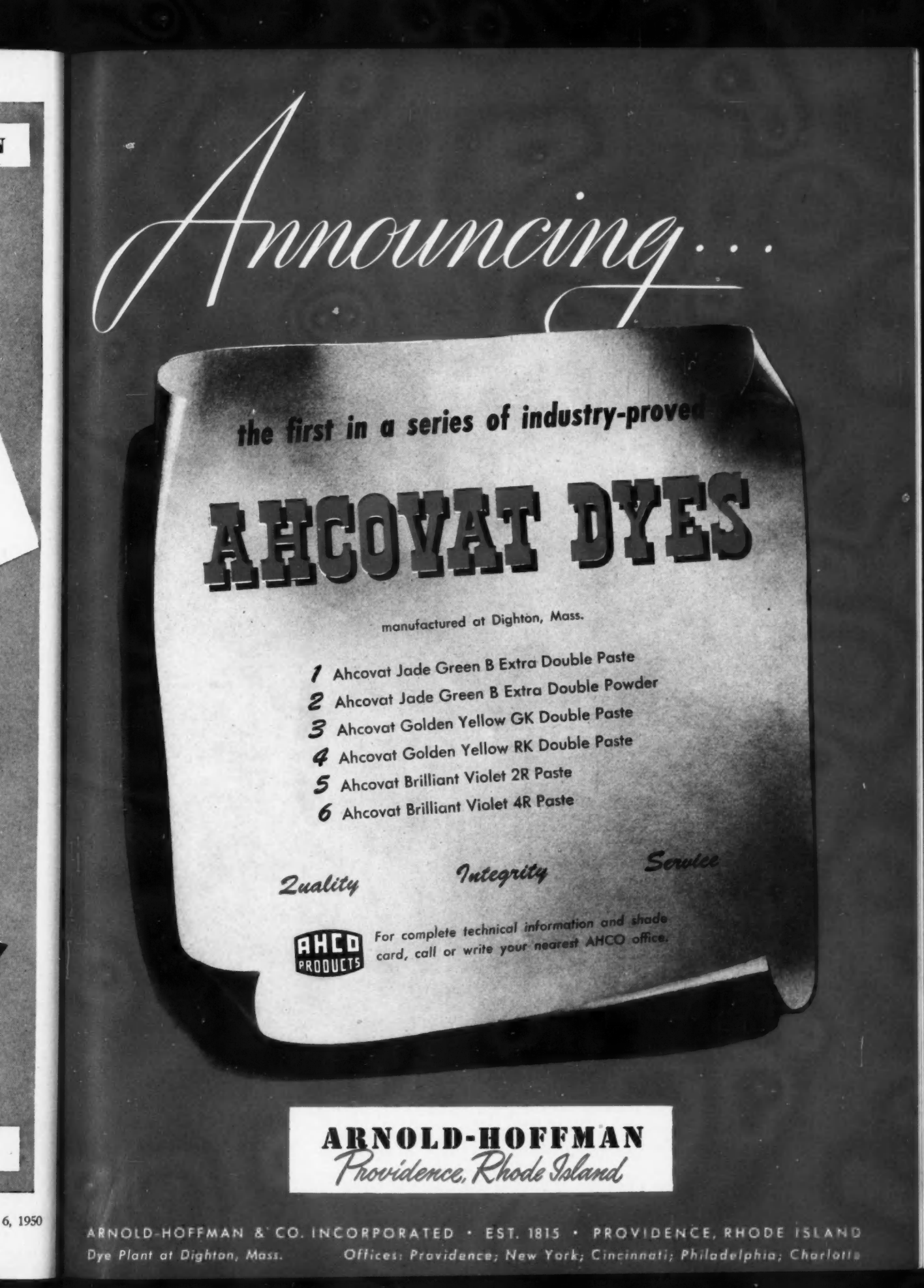
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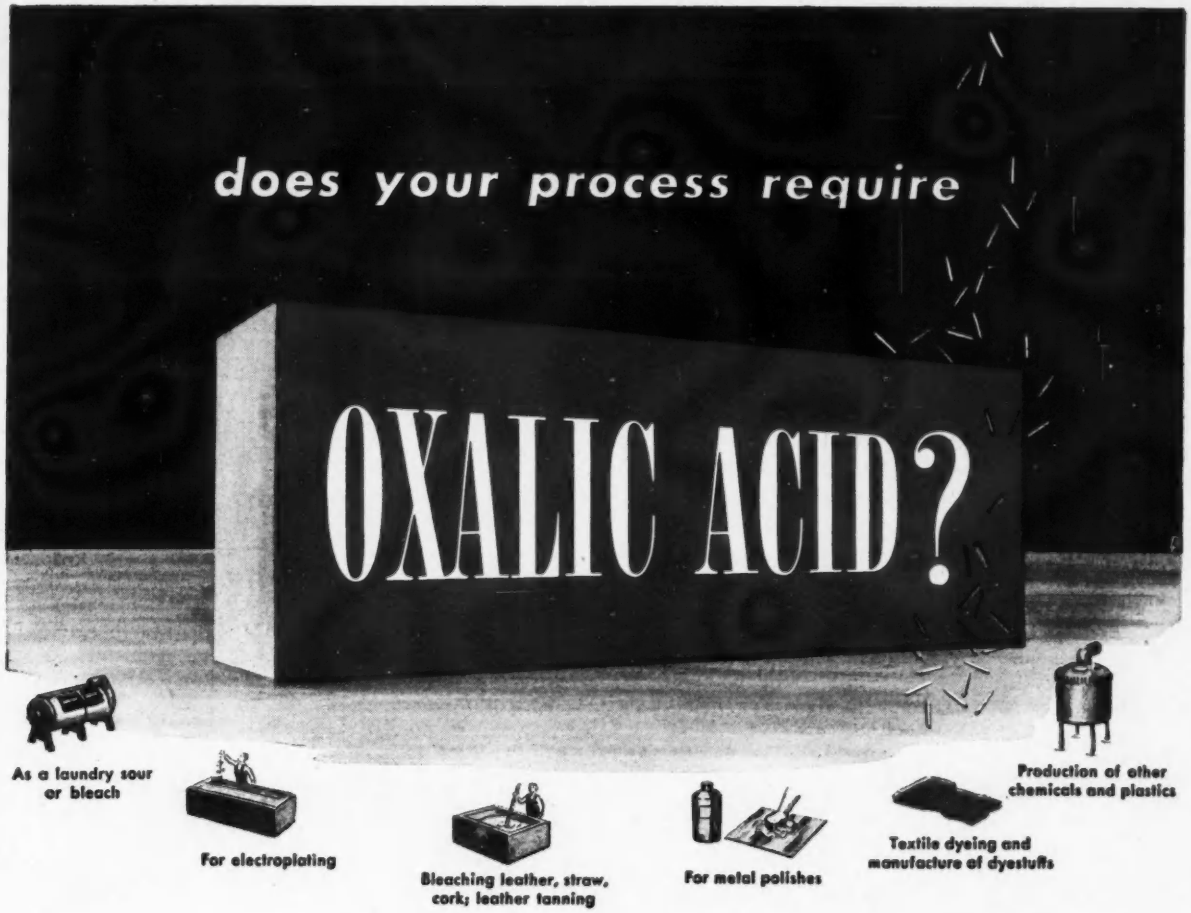
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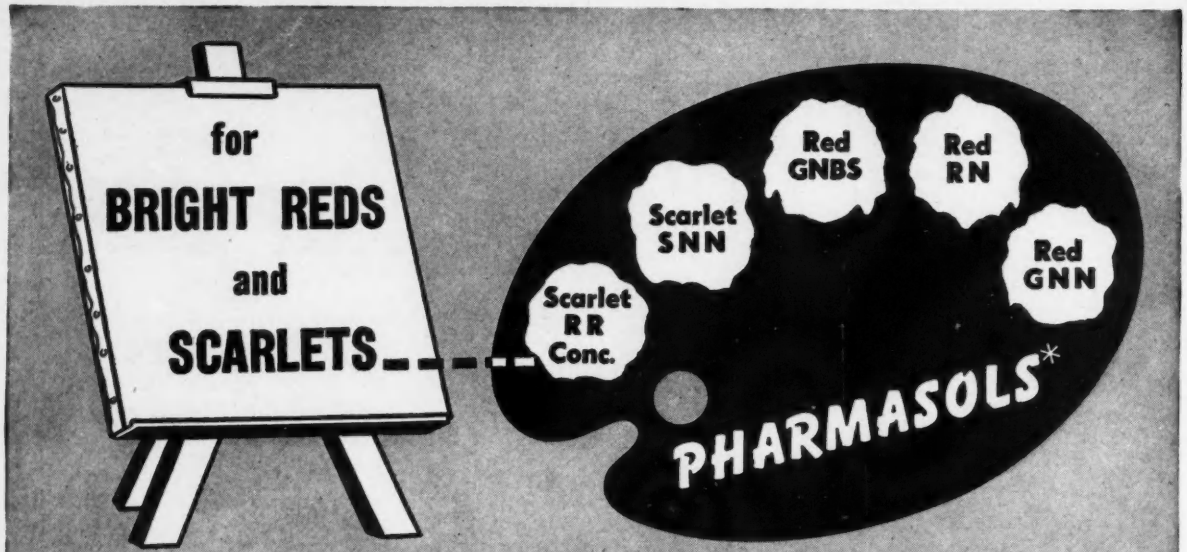

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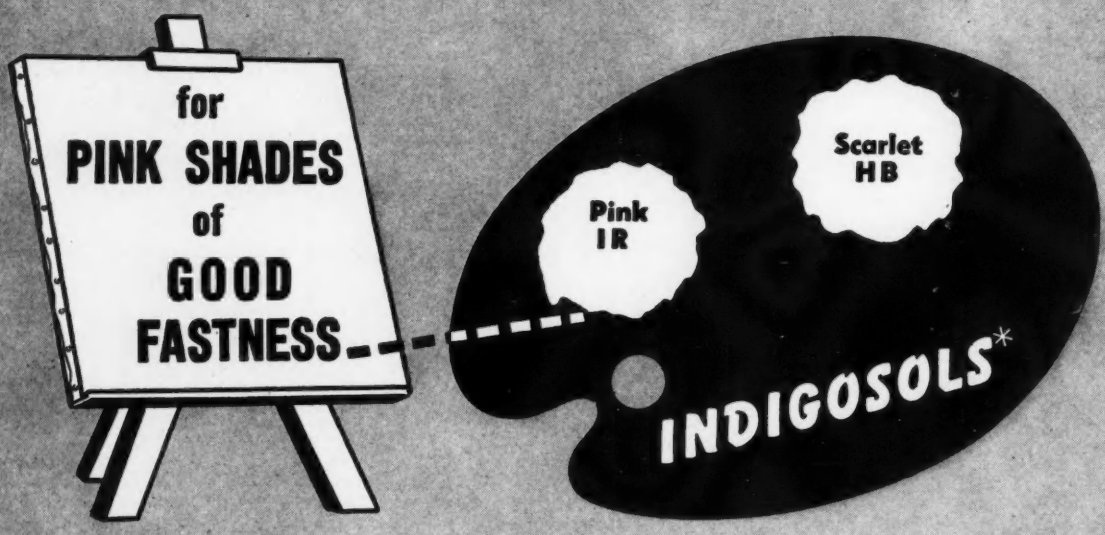

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Intersectional Contest—

THE APPLICATION OF THE DIFFERENTIAL DYEING TEST FOR FIBER MATURITY TO THE PROCESSING OF COTTON*

SOUTHEASTERN SECTION

Committee

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S. Jack Davis
Charles F. Goldthwait
Robert O. Simmons
Howard M. Waddle
Herbert O. Smith, *Speaker*

Introduction

THERE are always fibers on every cotton seed which fail to fully develop. These fibers have thin walls and are classed as immature, the terms thin-walled and immature in common usage being used interchangeably, although it is not a question of maturity in a true physiological sense. The percentage of thin-walled fibers on a seed was found by Pope and Ware *(7)* to be dependent mainly on growth conditions although some varietal differences were identified.

There is an increasing awareness in the cotton textile industry of the importance of fiber cell-wall development in manufacturing. Excessive amounts of thin-walled fibers in mill lots of cotton frequently cause difficulties in processing, increasing the cost of manufacture, lead to the production of inferior yarns and fabrics, and thereby lower their value. Campbell *(1)* reports that the immature fibers lack both the strength and convolutions of mature fibers and thus contribute less to the spinning quality of a cotton. It is well known and accepted that thin-walled fibers respond differently from well-developed fibers in practical dyeing processes and that this leads to difficulties in precisely matching dye shades from one lot to another. If unequally distributed in mill lots of cotton, immature fibers may also result in filling-bars in piece-dyed fabrics which can so detract from the appearance as to necessitate sale of the material as seconds.

Perhaps the most common and most serious problem encountered is excessive neppiness in the yarns and fabrics *(2)*. Crum *(3)* was the first to identify neps as small tangled bits of extremely thin-walled fibers which failed to color in dyeing. Walen *(8)* states that investigations into the structure and characteristics of neps in cotton yarn have led to the conclusion that the majority are caused by immature cotton fibers. Pearson *(6)* reports that fiber length and fineness influence neppiness, but that the proportion and distribution of thin-walled fibers contribute more to defective goods than either of the others.

The development of satisfactory methods of general applicability for determining fiber-wall thickness has lagged behind that of other techniques for evaluating other fiber properties. For example, staple length can be readily determined by the Fibrograph and fiber fineness indicated by the Micronaire. The conventional microscopic methods of estimating maturity, the so-called caustic soda and polarized light techniques, involve visual estimates that depend too largely upon the judgment and experience of the operator, and are also too tedious and time-consuming for use in mill-scale classification and selection of cottons for specific uses.

Recently, a unique method for distinguishing mature and immature fibers was developed at the Southern Regional Research Laboratory *(4)* which shows promise of fulfilling the need for a sim-

Figure 1. An estimate of percentage maturity is obtained by comparing the color of a differentially dyed sample with the colors of dyed reference standards.

* Presented at the Atlantic City Convention, October 14, 1949.

ple and relatively rapid technique for estimating cotton maturities. It is the purpose of this paper to describe briefly this method or test, and to discuss some of its applications in the processing of cotton.

The Method

The test involves a simple dyeing process and calls for inexpensive equipment. It depends upon the selective attraction of thick- and thin-walled fibers for two specially selected dyes, a red and a green, both applied in the same dyebath. Mature fibers in their natural state are colored a pronounced red while the immature appear as grayish-green to a distinct green.

The procedure employed is essentially that of ordinary direct dyeing except for an after-treatment in boiling water which actually amounts to a differential stripping of color, the red dye being relatively fugitive to hot washing. Before the final treatment in boiling water, the thick-walled fibers appear distinctly reddish since relatively little of the slowly diffusing green dye is absorbed in the allotted time under the conditions of the dyeing. The thin-walled fibers, on the other hand, take up both red and green in such a proportion as to make them appear neutral gray since these colors are complementary. When subjected to boiling water, an appreciable amount of red color is removed from the thick-walled fibers making them appear lighter in depth but still definitely red. A relatively greater quantity of red color is removed from the thinner-walled fibers due to larger pore diameters and the shorter distance through which the dye must diffuse outwardly *(5)*.

The differentiation of fibers by color in this test is attributed mainly to the very great difference in the diffusion rates of the dyes employed and to the difference in dye absorption characteristics of mature and immature fibers which are dependent upon cellulose structure.

As would be expected, cottons having different proportions of mature and immature fibers will dye to different overall shades and these resultant colors form the basis for a maturity estimate. Since cotton fibers tend to grow on the seed in separate areas of mature (red-dyeing) and immature (green-dyeing) fibers and come off in ginning in separate areas, some method of blending is required for a critical estimate of color. An effective blend can be obtained by cutting the dyed fibers in a Wiley mill, suspending the cut cottons in water containing an adhesive, and filtering out with suction in a fritted disc funnel to form a smooth flat pad. The estimates of maturity percentages are then made by comparing the colors of such pads with dyed reference standards differing by 5% maturity intervals over a very wide range (Figure 1).

TABLE I
Comparison of Fiber Properties of Two Cottons Which Differ in Tippiness

Fiber Property	*Deltapine 15 (Westlaco, Tex.)*	*Santan Acala (Ysleta, Tex.)*
Classer's Staple Length, inches	1-1/16	1-1/16
Fineness, μ/in. (Micronaire)	4.2	4.1
Caustic Maturity, percent	80	82
Dye Test Maturity, percent	87	69

TO REVEAL "TIPPINESS" IN COTTONS.—Maturity estimates from this dye test in a few instances were appreciably below those obtained by the caustic soda method on the same cottons. Careful examination of a number of such cottons showed that this disagreement was due, in certain samples, to incomplete cell-wall development at the fiber ends. For example, sorting of a differentially dyed sample of an extremely long-stapled cotton into length groups of 31/16" through 13/16" showed that the center portion of the fibers was colored red in contrast to the ends which were grayish-green. In the longest length group, approximately one-third of the fiber length at each end had dyed green. This indicated underdevelopment of the cell wall at both the base and tip. The extent of the cell-wall underdeveloment along the length of fiber decreased with decreasing fiber length and was no longer perceptible in the 15/16" length group. The extent to which this characteristic was exhibited by the fibers of this cotton was designated as its degree of "tippiness."

The maturity of this same cotton, determined as 79% by the caustic soda count, was estimated to be only 57% by the dye test. Examination of the dyed arrayed cotton would lead one to expect disagreement since the caustic technique involves measurement of the cell-wall development only at the midportion of the fibers whereas the dye test indicates the overall effect of different degrees of wall thickness.

The existence of this new fiber characteristic, "tippiness," is not indicated by the ordinary fiber property analyses. Table I shows data on the comparative fiber properties of a tippy Santan Acala cotton and of a Deltapine 15 variety which does not exhibit this peculairity. This illustration further indicates that tippiness in cotton fibers is not restricted to unusually long-stapled cotton varieties.

Fiber tensile strength, like maturity, is another property which commonly involves measure at the midportion of the fibers, and if the ends are abnormally thin-walled, a properly representative value may not be obtained. Since the full length of each fiber should contribute to yarn strength, pronounced variations in fiber-wall thickness may help explain difficulties in the prediction of yarn strengths from fiber tensile strengths.

Tippiness in fibers would also be expected to contribute to fiber tip breakage and, possibly, to the degree of neppiness because of the increased flexibility and deformability of the bases and tips.

The differential dye test is believed to be the only practical method for revealing the presence of fibers having relatively long thin-walled portions, and in such cases appears to indicate something about cotton character which cannot be brought out in any other way.

TO PREDICT SPINNING QUALITY OF COTTON.—To demonstrate to a manufacturer both the importance of fiber development as an indication of quality and the value of the dye test for predicting quality, two lots of cotton were selected because of their very different response to the dye test (although about equally priced on the basis of the classer's designations) and data were compiled from mill records on their spinning

TABLE II
Cotton Spinning Quality Indicated by Dye Test

	Lot A	*Lot B*
Classer's Grade	LM	MSp
Fineness, μ/in.	5.6	3.4
Maturity Percentage		
Caustic Soda Method	83.0	40.0
Dye Test Method	81.0	42.0
Manufacturing Waste—%'s		
Breaker picker	0.94	2.77
Finisher picker	0.09	0.47
Card flat strips	3.10	6.32
Card cylinder & doffer	1.39	5.50
Card motes & fly	2.62	2.71
Card sweepings	0.15	0.16
Total waste (on net fed opener)	8.21	17.45
Yarn Grade	A—	C

performance. One lot was shown by the dye test to contain an excessive amount of immature fibers (Table II) and was predicted to be inferior. During processing this lot did, in fact, give about twice the total percentage of waste as well as produce a yarn of much lower grade. Such data indicated that fiber development is related to quality, that immature fibers cause inferior products, that classer's designation of grade is not always adequate, and that the dye test is a more reliable method than others for the selection of cotton for efficient production and high quality in the manufactured products.

TO DISTINGUISH COTTONS THAT DO NOT DYE WELL TOGETHER.—A mill was interested in obtaining information on the dyeing characteristics of spotted, tinged, or stained cottons as possibly affected by immaturity when compared with normal white cotton. They were specifically interested in knowing whether it would be practical to use a percentage of Strict Middling Spotted together with Middling inch cotton for the manufacture of corduroys. Since such fabrics are usually dyed in heavy shades, the discoloration due to the spots in the cotton would not be expected to detract from the appearance of the finished goods. The spotting of cotton is not always due to the same cause, and is not necessarily accompanied by excessive immaturity. Cotton which had reached full maturity and whose bolls had opened normally, but which was discolored because of contact with wet bolls, stems, or leaves, would not be expected to contain undue amounts of thin-walled fibers. On the other hand, spottiness resulting from fungi, insect injury, or the action of frost on late-season bolls would undoubtedly be accompanied by a high proportion of immature fibers.

It was suggested that the differential dye test would distinguish for this manufacturer the cottons which would not dye well together. Accordingly, this mill furnished four samples each of Middling and Strict Middling Spotted grades for application of the test. The test showed the spotted cottons to be normal in every respect except for their color in the raw state and (Table III) indicated that the spotted samples were even more well-developed and thicker-walled than the samples from the middling grade.

TO DIAGNOSE PROCESSING DIFFICULTIES.—The differential dye test has been used to diagnose the cause of imperfections in yarns woven into fabrics.

Specifically, the test has been used to indicate whether the difficulty encountered by a manufacturer of denims in processing was due to neppiness caused by abnormal amounts of the extremely thin-walled, or "dead," fibers known to produce neps. The trouble encountered resulted from an excessive number of white specks on a blue background which appeared mainly to be imperfections in the uncolored filling yarns. When the manufacturer changed from the use of Low Middling to higher grades of cotton, the use of the higher-priced cottons failed to remedy the defect. At this point four samples from each of the four different grades of cotton that had been used without success were subjected to the differential dye test. It seemed fairly certain from the results (Table IV) that none of the cottons was of the type that would be expected to produce neps. All of the samples tested showed above average maturity and the pronounced red shades obtained further indicated that the cottons were coarse-fibered types. These results suggested a critical examination of the type of fibers comprising the yarn imperfections, referred to as neps by the mill. When a sample of this denim material was dyed by the differential dyeing technique, it was shown to contain few of the type of neps which tend to resist dyes, that is, those which contain "dead" fibers. A large number of the imperfections were shown to be fragments of broken seed with fuzz hairs attached, colored a distinct red in the test.

These results confirmed the opinion that the trouble encountered was due mainly to the method of handling the cotton during manufacture rather than to the type of cotton being used. A point of great interest to representatives of the mill was the fact that they were paying as much as 6¼ cents per pound more for the higher grades of cotton while the dye test showed the fibers in the lower grades to be fully as well developed.

TO INDICATE EFFECTIVENESS OF BLENDING JUDGED BY NUMBER OF NEPS.—Dyeings were made of two series of samples each including raw stock, lap from a one-process picker, card sliver, finisher drawing sliver, roving, and yarn. These samples, identified as Set Nos. 1 and 2, represented two entirely different methods of manufacture, the resultant yarns being intended for widely different end uses. Maturities of the raw stock samples from the two sets were estimated by the dye test as 78% and 80%, respectively, and the dyed samples from the subsequent steps of processing showed no significant change in these proportions. There appeared, however, to be a difference in the effectiveness of blending of the thin-walled fibers, more neps being discernible in Set No. 2 samples than in the corresponding samples in Set No. 1. The number of neps in a given sample is said to be the result not only of the influence of the specific characteristics of the particular cotton, but also of the type of treatment it has received during processing. Thus, the lower yarn grade resulting from the greater number of green-dyeing neps in Set No. 2 yarn is attributed to the method of processing, particularly in the carding and drawing stages, rather than to differences in the properties of the cottons employed.

TO INDICATE THE NATURE OF PROCESSING WASTE.—The waste as well as the stock from an additional lot of cotton was studied after application of the differential dye test. Results on the stock corroborated previous evidence that there was no significant tendency

TABLE III

Comparison of Cell-Wall Development of Fibers in Spotted and Normal White Cottons

Sample No.	Maturity Estimate—by Color	
	Middling	Strict Middling, Spotted
	Percent	Percent
1	79	75
2	73	90
3	74	84
4	78	87

TABLE IV

Fiber Development in Different Grades of Cotton Indicated by the Differential Dye Test

Classer's Grade	Maturity	Classer's Grade	Maturity
	Percent		Percent
Low Middling	91	Middling	91
Low Middling	90	Middling	93
Low Middling	90	Middling	80
Low Middling	81	Middling	85
Strict Low Middling	90	Strict Middling	88
Strict Low Middling	89	Strict Middling	87
Strict Low Middling	89	Strict Middling	88
Strict Low Middling	90	Strict Middling	91

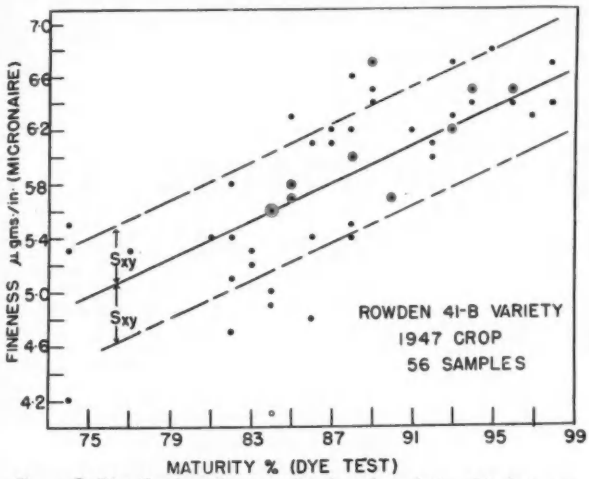

Figure 2. Distribution diagram showing the relationship between maturity (Dye Test) and fineness (Micronaire) for 56 samples of Rowden 41-B cotton.

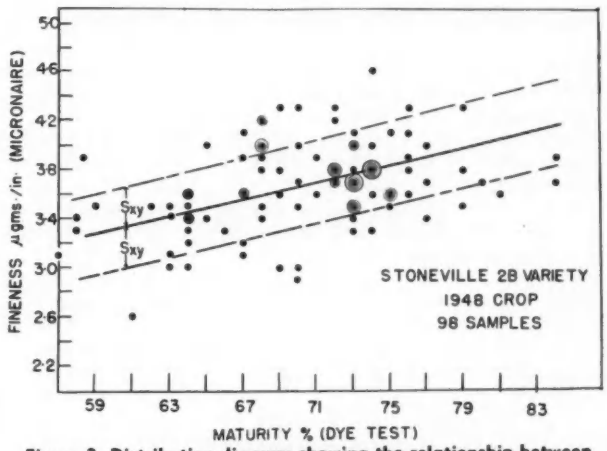

Figure 3. Distribution diagram showing the relationship between maturity (Dye Test) and fineness (Micronaire) for 98 samples of Stoneville 2B cotton.

toward the selective removal of immature fibers during any step in the manufacture of a carded yarn. Before application of the dye test, samples of waste from the same lot of cotton were passed once through a Shirley Analyzer to separate, as much as possible, the lint from the non-recoverable material. Results from the dyeing indicated that the cleaned waste was composed mainly of well-developed, spinnable fibers except for those from the filters and screens. The residual materials from the Analyzer which were also dyed differentially were found to contain, in addition to leaves and stems, a large number of motes and fragments from mature seeds with attached fibers, some of which were colored a pronounced red. Others appeared distinctly green, probably from the chalazal caps of the seeds where underdeveloped fibers are known to predominate.

Finally, a study was made by means of the dye test of waste and stock samples taken from the principal steps in the manufacture of a combed yarn. The combing operation is primarily intended to selectively remove the shorter fibers in order to produce yarns of greater strength and improved appearance. Results similar to those previously described were obtained with those samples taken from the various stages of processing preceding the combing operation. Comparison of the dyed raw stock, comber noil, and comber sliver gave definite evidence of a tendency toward the selective removal of immature fibers in this particular operation.

TO PROVIDE EVIDENCE OF THE RELATIONSHIP OF FINENESS TO MATURITY.—Since the extremely thin-walled or "dead" fibers which tend to roll up easily into knots and (nep-forming) tangles in the opening, cleaning, and carding of cotton are easily distinguished in the differentially dyed raw stock, the test has served as a method for the classification and selection of cotton best suited for use in fabrics (e.g., denims and chambrays) where neppiness is especially objectionable.

Another test which provides an index to the relative fiber-wall development of cottons is the Micronaire test although it is principally employed for the estimation of fiber fineness by means of the air-permeability principle. A direct general relationship exists between fiber wall thickening (maturity) and actual fiber weight per inch (fineness) since both are measures of the quantity of cellulose deposited in the cell wall. Thus, both the dye test and the Micronaire involve indirect methods for evaluating these two fiber properties. The dye test is dependent upon differences in cellulosic structure which are associated with fiber wall development to distinguish mature and immature fibers. Fineness estimates by the Micronaire are influenced by differences in fiber shape and total surface in a definite weight of fibers. Consequently, close agreement of maturity and Micronaire fineness can be expected only when the peripheries of fibers in different cottons do not differ appreciably.

An investigation was therefore made to show the relationship of maturity by the dye test and fineness by the Micronaire. Two groups of cotton samples were classified by both techniques. The first group contained 56 samples of a Rowden 41B variety (1947 crop), a coarse-fibered type of cotton. The second group contained 98 samples of a Stoneville 2B variety (1948 crop), a relatively fine-fibered cotton. When Micronaire fineness was plotted against percentage of maturity by color (Figure 2), a relationship was found for the Rowden samples which can be expressed by the equation:

Fineness = 0.48 + 0.072 (Maturity)

and for the Stoneville samples (Figure 3):

Fineness = 1.09 + 0.037 (Maturity)

The standard errors of estimate were 0.48 and 0.33 micrograms per inch and the simple coefficients of correlation were found to be 0.70 and 0.51 for the Rowden and Stoneville samples, respectively. The coefficients of determination were 0.49 and 0.26 which implies that 51% and 74% of the variance of Micronaire fineness could not be accounted for by variance in maturity. Since the production of neps is reported to be influenced by the maturity of cotton more than by any other single fiber property, the dye test would appear to be more reliable for identifying cottons likely to produce neps than Micronaire fineness, which has less relation to maturity.

Summary

A unique method for distinguishing mature and immature fibers by the use of dyes has been useful in a number of different applications during the processing of cottons. The dye test is thought to be the only practical method for indicating partial maturity of fibers, designated as "tippiness," a form of incomplete development of the cell wall at both base and tip. The technique has been utilized for selecting special cottons to illustrate that immature fibers cause inferior products and that selection of cotton by means of classer's designation of grade is not always adequate to insure efficient production and maximum quality. Differential dyeing has been em-

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Auxiliaries and Testing Group—

APPLICATIONS OF THE AUTOMATIC TRISTIMULUS INTEGRATOR TO TEXTILE MILL PRACTICE*

H. R. DAVIDSON and I. H. GODLOVE

Central Research Laboratory, General Aniline and Film Corp., Easton, Penna.

Abstract

Use of the GAF-Librascope Automatic Tristimulus Integrator with the General Electric Recording Spectrophotometer permits tristimulus measurement and description of color with a precision equal to that of the eye. When a trained colorist is available for routine production testing, his speed makes him superior to the instruments, but there are special fields of application in which the instruments can be of assistance to the colorist. Some of these are in specification of standards and standard color tolerances, evalution of levelness, dyer's brightness and fading, and in the solution of dye shading problems. Recently obtained data on wool dyeings indicate the limits of acceptable color matches in terms of tristimulus values for particular applications. Numerical data on the levelness of wool dyeings illustrate the degrees of unlevelness encountered in practice and the effect of leveling agents. The relative uniformity of American, British and German fastness standards has been established by means of measurement with the instruments. Dye mixture experiments show that several methods of shading dye batches in production and use can be employed after tristimulus values have been obtained.

Introduction

INTRODUCTION of the automatic tristimulus integrator *(1)* has made practical the application of numerical colorimetry to a large number of textile mill problems. It is the purpose of this paper to discuss the need for numerical colorimetry, to indicate the manner in which a combined spectrophotometer and integrator satisfy that need, and to describe several of the numerous possible applications to textile problems.

Need for Objective Measurements

Many of the problems which beset the paths of people working with color may be traced to the lack of an objective, numerical system of measuring and describing color. Consider, for a moment, a few of these problems. What is the meaning of "acceptable match"? Granted, its meaning will depend upon the purpose for which the match is made, but what is an acceptable match for a particular customer's order? Perhaps the definition is simple: an "acceptable match" is a match the customer will accept. But how is it specified; what means does the dyer have of knowing before hand just how close his match must be? And if limits of tolerance are set up by means of off-standard samples, how can the dyer know that what he believes falls within these limits will also please the customer? The answer must be that he cannot know and that the only authority on what is meant by "acceptable match" is the customer. Furthermore, what the customer accepts today he may reject tomorrow.

This point may be illustrated by the data in Figure 1. Each of four professional colorists was asked to make three independent judgments of the match between sample and standard wool dyeings.

Sample	*Colorist*			
	A	*B*	*C*	*D*
Blue 12	3	0	0	1
Blue 21	0	1	3	3
Red 7	0	0	3	2
Red 16	3	2	1	0
Red 21	3	0	1	0
Green 16	0	0	0	2

Figure 1

Judgments of "Acceptable Match". The figures in the columns under each colorist indicate the number of times he called the sample an "acceptable match". Three independent judgments were made of each sample by each colorist.

The results of the judgments on acceptability of a few of the samples are shown in the figure. Note the differences in opinion as to what is acceptable. If the colorists were basing their judgments on different sizes of allowable color differences, one would expect the least critical colorist to accept all of those samples accepted by the most critical, plus a few more. This appears to be the explanation of the difference between colorist B and the others. Colorist B wants closer matches than do the others. But the differences between colorists A, C and D cannot be explained in this manner. For example, A accepted Blue 12 and C rejected it, but A rejected Blue 21 and C accepted it. Of course, the color differences here are small, yet they are large enough so that all of the samples were rejected three times by at least one colorist. These data, it should be noted, may not be construed as questioning the ability of these colorists, for they are all men of the highest skill in their profession. The results of this experiment do indicate that there are, as the colorists themselves well know, genuine differences of opinion in the judgment of acceptability even when the judging is done by experts. How much more prevalent must these differences be when the judging is done by people of lesser skill? And when a difference of opinion between dyer and customer arises on this point, nothing other than informed (and often uninformed) opinion is relied upon for settlement.

Definition of acceptable match is one example of the difficulties arising because of a lack of objectivity in color measurement. A few others are the meaning of color names, the meaning of "acceptable break" in fastness tests, and the exact meaning of strength, dullness and brightness.

Further complications are introduced by the differences between the eyes of one person and those of another. As an ex-

* Presented at Atlantic City Convention, October 14, 1949.

(1) Davidson, H. R., and Imm, L. W., Jour. Opt. Soc. Am. *39*, 942, Nov. '49.

	Colorist			
Sample	*A*	*B*	*C*	*D*
Red 8	ooW_o	obW_o	dow_1	doo_o
Red20	Byo_1	ByW_o	Boo_1	BYS_o
Green 17	doS_o	bos_1	oYo_1	ooS_1
Blue 8	Bro_1	Bgs_o	Brs_o	Bgo_1
Blue 22	Boo_1	BGW_o	Boo_1	boS_o

Figure 2

Judgments of small color differences. Each sample is judged for the three attributes, brightness, shade and strength in that order. o means the attribute was judged equal or that it was specified only once. Lower case letters indicate that the attribute was judged twice as indicated, and upper case letters indicate it was judged three times as indicated. Meanings of the letters (both upper and lower case) are: b=bright, d=dull, y=yellow, r= red, g=green, b=blue, w=weak, s=strong. The subscript numerals have the same meaning as in Figure 1. Three independent judgments were made of each sample by each colorist.

ample of this difference, consider the data given in Figure 2. The same four colorists who supplied the data for Figure 1 also furnished these judgments. Again, there can be no question of their ability to see differences and to name them, yet notice how contradictory their judgments of the same sample can be. Colorist A is certain that sample Red 8 differs from standard only by weakness, while colorist D is almost as certain that it differs only by dullness. Two of the colorists called Blue 8 redder, the other two called it greener than standard. In each case the color difference was small enough so that at least one of the observers called the sample an acceptable match at least one out of three times. This means that the samples were not so different from standard in any one attribute, strength, brightness or shade, so that judgments of other attributes would be uncertain. On the other hand, the differences were sufficiently great so that no sample was accepted by all four colorists, and no colorist called any sample an acceptable match more than once. In other words, the color differences illustrated by these examples are of about the same size as one encounters in making very close color matches.

The importance of the discrepancies shown in Figure 2 does not lie so much in the naming of color differences as in the procedure which would be followed to correct the differences between standard and sample. Colorist B, for example, would make the dye bath for Red 20 stronger, whereas Colorist D would make it weaker. Colorists A and C would make the dye bath for Blue 8 slightly greener, but colorists B and D would make it slightly redder.

As a comparison with the process involved in measuring and describing color difference, let us consider the state of affairs in another field. A customer will specify a steel shaft as one inch, plus or minus 5 ten thousandths of an inch in diameter and 10 inches, plus or minus 2 thousandths in length. There need be no prolonged argument about whether the shaft offered by the manufacturer meets these specifications. If the customer is in doubt, he simply measures the shaft, and any argument is immediately settled by standardized measurements. Notice that there are three distinct advantages in this system of specification. First, individual judgment does not enter at any point after the specifications have been agreed upon. Second, specifications are in language understandable to any manufacturer; the customer does not say he wants a medium length shaft, he says he wants one 10 inches long. Third, limits of tolerance are unambiguously established; the customer does not say the shaft must be almost exactly one inch in diameter, he says it must be within 5 ten thosandths of one inch in diameter. The importance of this specification of tolerance must not be overlooked. It insures against inferior quality and at the same time prevents excessive cost by preventing the manufacturer from spending time on holding the tolerances more closely than the customer requires.

Although it would obviously be of great benefit to introduce some comparable methods into the specification of color, one may ask whether there are any possible disadvantages to objective methods which would offset the advantages. There appear to be two possible objections, the first of which involves economics. Much time and money is required for the purchase, use and standardization of instruments. Would the expected advantages be worth the cost? At present, we must answer, instruments cannot compete economically with trained colorists for routine work. Furthermore, color, by which we mean the combination of all of those properties by which we distinguish one colored surface from another, may not as easily be put into an objective form as may the dimensions of the steel shaft. For this reason, the trained colorist is superior to present day instruments for many applications. In special cases, however, particularly in specification of tolerance, mixing of color, standardization, and trouble shooting, the case is reversed. Even a trained eye is far less precise than present instruments in specifying color relationships other than nearly exact matches. This is particularly true in specification of shade, or hue. For many applications, numerical colorimetry has proved its value, economically, to various mills. Now that more rapid and precise integration is possible, it should prove even more valuable.

The second objection to objective measurements is that customers will specify color matches more rigorously than they do now and, therefore, make life more costly and miserable for the dyer. Let us return to the analogy with the steel shaft. Does the customer specify the diameter to millionths of an inch because he happens to have a gauge that will measure to millionths? Certainly not. If he can use a shaft with a diameter as much as 5 ten thousandths of an inch different from one inch, he will use this figure for tolerance regardless of how closely his gauges will measure, simply because the cost of the shaft will be increased if he specifies smaller tolerances. Put in another form, this argument against instrumentation reduces to an objection that the customer's use of instrumentation would enable him to check on the dyer. But how often today does the customer check on the dyer and unjustly claim that his specifications have not been met? And what comeback does the dyer have? Certainly instrumentation would be of use in this case, particularly to the party in the right.

ICI Specification of Color

The most generally applicable method of introducing objectivity into color measurement and description is that proposed by the International Commission on Illumination (ICI) in 1931, and since it has been amply described in many publications, it need not be described in detail here *(2)*. Suffice it to say that any color can be matched by a combination of three suitably chosen colored lights mixed together in suitable proportions. If the primaries are standardized, then the amounts required will constitute an unambiguous specification of the color under standardized conditions. These amounts of the three primary lights are known as the tristimulus values X, Y and Z, and the amounts of each expressed as percentage, x, y and z, are known as the trichromatic coefficients. Fortunately, it is not necessary to make a match with these lights and the sample in order to specify the color of the sample. Instead, we may calculate the amounts which would be required if the match were actually made. Since color is compounded of three factors, the source of illumination under which we view the color, the nature of the light reflected or transmitted by the colored sample, and the fundamental properties of the eye itself all must be combined in the calculations. Data on light sources and on the eye have been standardized, and data on the colored sample may be obtained from the record-

(2) Judd, D. B. JOSA 23, 359, Oct. 1933. Hardy, A. C. "Handbook of Colorimetry", Technology Press, Cambridge, Mass., 1936.

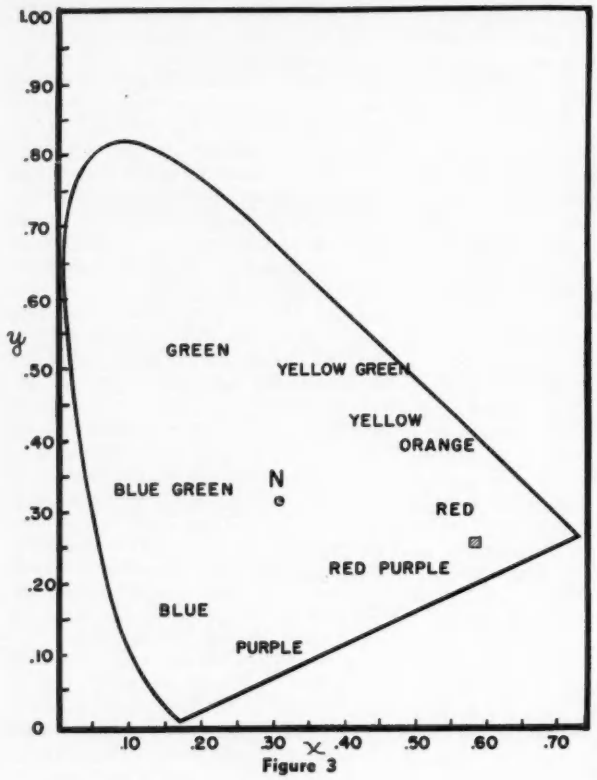
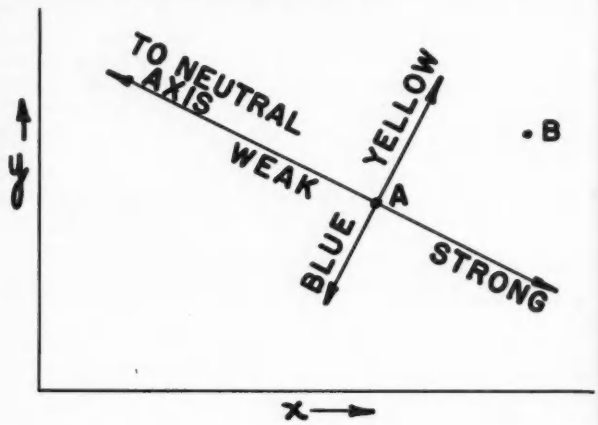


Figure 3



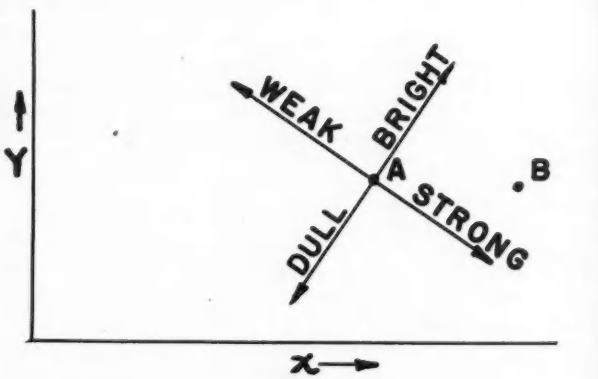


Figure 4
Meaning of Differences in I.C.I. Specifications. Dyeing B is Stronger, Brighter and Yellower than Dyeing A.

ing spectrophotometer†. Calculations of the tristimulus values are rather laborious and time-consuming if undertaken in the conventional manner, particularly if a high degree of accuracy is required in the result. For this reason, the use of tristimulus values on any large scale has not heretofore been practical. Now that an automatic integrator is available, however, the way is opened for much more extensive use of this system of numerical colorimetry.

The relationships of the trichromatic coefficients of different colors and the meaning of small changes in these values can best be illustrated by reference to Figures 3 and 4. The x and y trichromatic coffiecients of colors may be plotted in a diagram such as Figure 3. The spectrum and non-spectrum, or purple, colors fall on the solid line, and all colors fall within the figure bounded by that line. The neutrals, black through gray to white, plot on the point marked N if we compute values for standard daylight illumination, and the other colors fall in the general regions indicated. This is a plane figure, but color must be specified by three numbers; thus, many different colors may be represented by a single point. All of these colors, however, will be identical except for lightness. Thus, if we plot the lightness (simply the Y tristimulus value) on an axis perpendicular to the plane, or if we record the Y value beside each point, we will have unambiguously specified every color. In Figure 4 an expanded portion of the diagram is given, showing all three dimensions in order to illustrate the meaning of changes in values. In the case of the color of a red dyeing (A), the tristimulus value Y and the trichromatic coefficients x and y will vary in the direction shown as the strength and shade of the dyeing are varied. As strength is slightly increased, the lightness decreases, the color (in most cases) moves away from neutral toward the spectrum colors, and the shade remains relatively constant. If point A represents the color of a standard and point B represents the color of a sample, then the sample would appear stronger, yellower and brighter than the standard.

Figure 5 is a photograph of a color solid constructed according to this system of specification. The x and y coordinates run along the sides of the box, and the Y value is represented by the height of the samples from the bottom of the box. Samples having approximately the same Y value, or lightness, are placed on the same shelf. The neutral grays, the rectangular pieces in the photograph, are placed on each shelf at the point marked N in Figure 3, so that black is at the bottom and white at the top. The lines drawn on each shelf represent the pigment limits. No surface colors can be made to lie outside of the figure, bounded by

†Since the recording spectrophotometer does not provide an accurate measurement on fluorescent colors, such samples cannot be treated in the manner herein described.

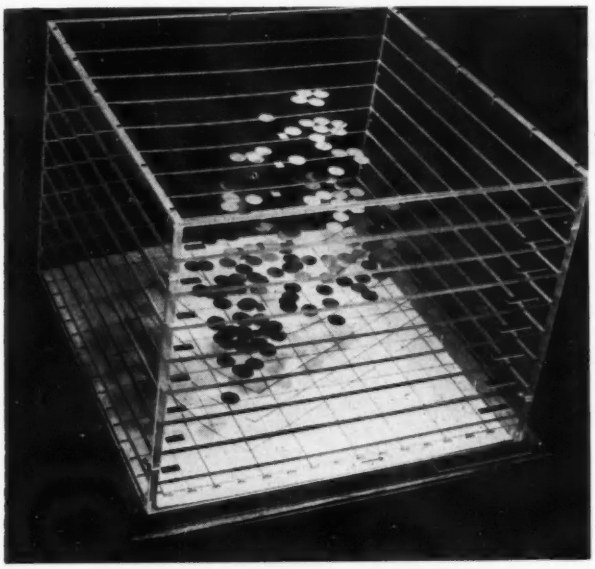


Figure 5

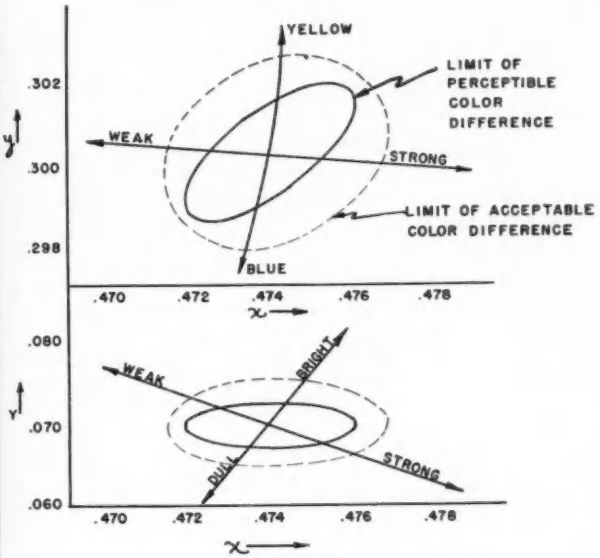


Figure 6
Use of I.C.I. Diagram in Evaluating Color Matches.

these lines *(3)*.

Precision of Instruments

In considering the application of tristimulus values to textile mill problems, the first question one wants answered is this: how precise is the measuring instrument in terms of what the eye can see? The answer depends to a considerable extent upon the color being considered and the size of the samples available for the eye to examine. In general, the combined spectrophotometer and integrator appear to be more sensitive than the eye on light samples and about equal on dark samples. In any case, however, the difference in precision between the eye and these instruments will not be the determining factor in the use of the instruments. The precision obtainable appears to be adequate for any practical application.

There are, of course, various other instruments which can be used for the objective specification of color. For specialized applications where speed is of more importance than accuracy, or where only a limited amount of information is needed, simple and cheap instruments may be used. For a large number of textile mill problems, however, the recording spectrophotometer and automatic integrator are required as the most accurate means of introducing numerical solutions.

Application

CLASSIFICATION.—The first application that comes to mind is the obvious one of color specification, or classification. No longer is it necessary to rely on such exotic names as Elephant's Breath, much as these may be useful in sales promotion. Any color can now be specified by three numbers, and if a reproduction of that color is desired at some subsequent time, the numbers are all that will be necessary to check the reproduction. Simply as a means of classification, then, this numerical system should find widespread use in the textile field.

SPECIFICATION OF TOLERANCE.—Of more importance in day to day operation is the application of numerical colorimetry to the specification of color tolerance. If numerical specifications had been set up for the samples illustrated in Figure 1, there would have been no disagreements on what was and what was not acceptable.

Let us assume that the dyer and his customer have agreed on a tolerance specification. It will, of course, be no closer than the ability of the eye to distinguish color, and in the majority of cases will allow for considerably larger color differences than those detectable by eye. Off standard samples might be measured and used as the basis of the specification, or some one of the several color difference formulas *(4)* might be used. But however the specification is set up, its application becomes almost as simple as in the case of the steel shaft.

In Figure 6, a standard for, let us say, a wool dyeing is plotted in two diagrams. The upper shows the trichromatic coefficients x and y, and the lower shows x and the lightness or Y value. Around the standard in both cases are drawn ellipses. The inner one represents the limits of tolerance of the eye *(5)*; the outer one represents the limits of an acceptable match agreed upon by customer and manufacturer. The dyer will make up what he thinks will be a match, measure it, and plot the point in the diagram. If in both diagrams of Figure 5 it falls within the inner ellipse, it will be indistinguishable from the original. If it falls within the outer ellipse, it may be noticeably different from the original but will still be acceptable. Anything falling outside of the ellipses in either diagram will be rejected. Now when the customer receives the goods and voices an objection to the match, the goods can be remeasured and the numbers supplied just as in the case of the steel shaft. This is a somewhat oversimplified picture of the measurements in textiles because of the unlevelness of any dyeing, but usually in practice this merely means measurement at several different spots on the cloth.

PREDICTION OF DYE MIXTURES.—Specification of what is meant by a match naturally invites the question of how this match is to be achieved. Can the amount of dyes required to make a match with a given sample be calculated

(3) MacAdam, D. L., JOSA *25*, 249, August 1935.

(4) Nickerson, D. and Stultz, K. F. JOSA, 34, 550, Sept. 1944.

(5) The inner ellipse in the x y diagram is that established by MacAdam, JOSA, 32, 247-274, May 1942, while the inner ellipse in the x Y diagram is that estimated by the authors on the basis of judgments of textile samples made under different conditions.

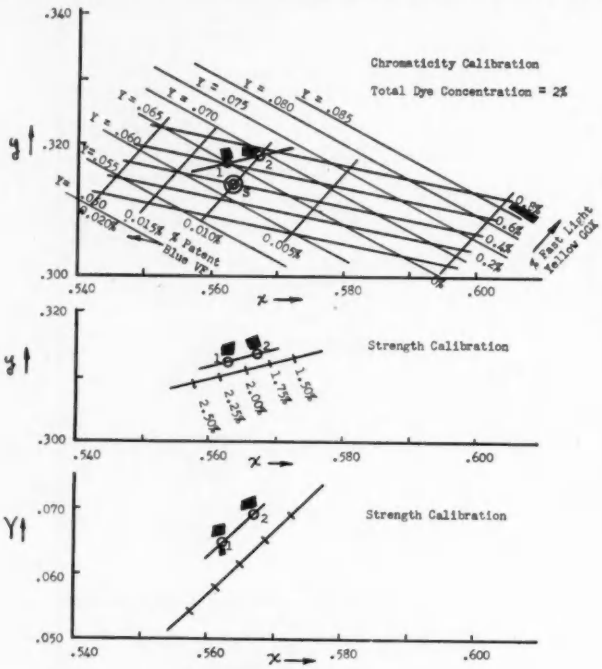


Figure 7
Control for Wool Dyeing
Fast Red A Shaded with Patent Blue VF and Fast Light Yellow GGX.

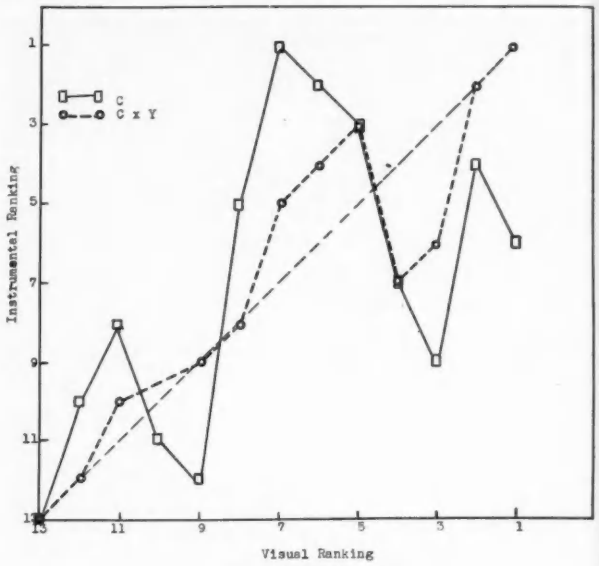


Figure 8
Dyers' "Brightness" Ranking
Moderate Strength Series of Dyeings.

from tristimulus values? Certainly it is not possible, today, for a dyer to measure any randomly chosen sample, calculate how much specified dyestuffs are needed, make the calculated dyeing and come out with a nearly perfect match. In the future, when the required data have been tabulated, such a procedure will probably be extensively used. However, we can, at present, set up empirical systems for specified colors.

An empirical method of dye bath control is illustrated by the diagrams in Figure 7. These diagrams were made up for the case in which wool is dyed with Fast Red A shaded by small amounts of Patent Blue VF and Fast Light Yellow GGX. The standard dyeing, marked S in the chromaticity diagram, is made by dyeing 0.010%† blue, 0.4% yellow and 1.59% red on the cloth. Experimental dyeings of slightly different amounts of the three dyes were then made, measured and plotted to form the chromaticity diagram. In order to determine the effect of dye strength changes, experimental dyeings in which only the strength was varied were made, measured and plotted.

The method of using the diagrams of Figure 7 is as follows. Suppose that a trial dyeing is made and plots at point (1) in the three diagrams. It is too far from the standard (S) to be acceptable, therefore the dye bath must be corrected. This can be done as follows. In order to move the point (1) to the position of the standard S, we must, according to the chromaticity calibration, decrease the amount of yellow by 0.2% and decrease the amount of blue by 0.002%. Consequently, we must increase the amount of red by 0.202% in order to maintain a total dye concentration of 2%. The actual amounts which must be added and the amount of dye bath which must be drawn off to correct the color may be calculated on the basis of the total volume of dye bath being used. In this case, the color of the sample can also be corrected in another way. If the concentration is decreased, then point (1) may be moved to point (2). The position of point (2) is determined from the strength calibration diagrams by moving from (1) in the direction of decreasing strength along lines parallel to those shown. Thus, by decreasing the concentration by 0.30%, the sample would have the color indicated by point (2). Now, if the concentration of yellow is reduced by 0.35% and consequently the red increased by 0.35%, the dye bath will be properly corrected. This manner of correction will save about 0.3% of dye.

In a large number of cases, the control described above can more easily be carried out in solution. When this can be done, the procedure is greatly simplified because experimental dyeings do not have to be made. The diagrams can be made simply by measuring solutions and plotting the results in a manner similar to that described above. In continuous dyeing operations, the dye bath can be continuously controlled by measuring the dye bath and making adjustments as determined from the diagrams.

Evaluation of Dyer's Brightness

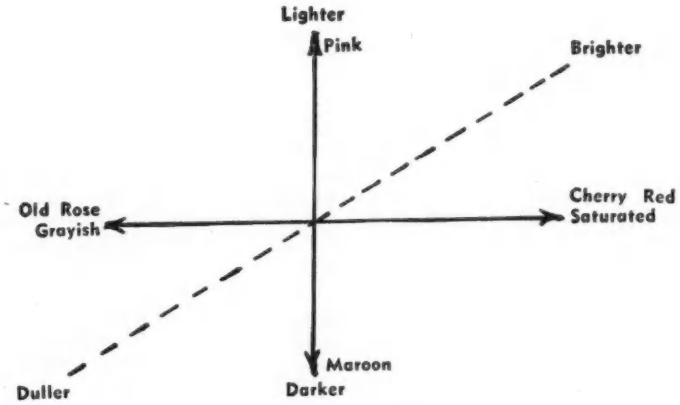
A highly important problem in a dyestuff research laboratory or textile mill is the estimation of "brightness" as in prints produced with different printing paste formulas, or a new research dye sample compared with a "type" or competitive dye. Since this determination is difficult, an objective method of measuring dyer's brightness is very desirable. A way of computing brightness very simply from the tristimulus values has been found and has been applied with some success to problems such as those just indicated. Since it is hoped that discussion of this subject will be forthcoming in a separate paper, only the outline of its development will be given here.

Several facts suggest that brightness is closely related to saturation, the opposite of (or departure from) grayness, weighted by some function of the amount of light reflected from the sample. For example, the brightness of a billboard seen at a distance depends not only on the contrast of the colors with the general grayness of the background but upon the amount

†All percentages are given in terms of the weight of dye on the cloth and the weight of cloth being dyed.

of light reflected, light billboard colors being brighter than dark ones. The way in which saturation must be combined with reflectance (Y value) remains to be determined experimentally.

A second fact, observed over a long course of years by one of us, is that in comparing similar dye solutions or dyeings, a broader absorption band (meaning less light reaching the eye), corresponds to the duller color and the narrower band to the brighter color. Third, when dyers and others are asked to point to samples which they regard as "dull" and those they regard as "bright", the dull ones are not merely grayish and the bright ones not merely vivid or saturated. The samples called dull are grayish and relatively dark, while those called bright are saturated and relatively light. That is, if we arrange the reds in two dimensions* thus:



then the path dull←——→bright lies along a diagonal.

A fourth fact is closely related. In 1943, Imperial Chemical Industries chemists found that their trained colorists estimate strength of dyeings mainly by comparing saturations, while more naive non-colorists estimate strength by the often more readily observed lightness difference. They all use both saturation and lightness, and try to make strengths equal in the samples before judging brightness. But dullness is frequently mistaken for strength (which leads to darkness), and brightness for weakness (which yields lightness).

Indeed, the visual dimensions lightness and saturation are so closely connected that for many years the term brightness was used for each of these two attributes by different groups of persons, even in official designations of societies. The above figure should make their relation clearer, and the relationship of strength to the other quantities is shown by drawing the remaining diagonal roughly perpendicular to grayness←——→dullness.

To determine a more precise numerical measure of brightness, three sets of paper dyeings of all hues, each set of constant strength within itself, were arranged in order of brightness by six experienced observers. They were then measured and tristimulus values were computed, converted to saturation (Munsell chroma) and multiplied by reflectance (Y), as well as by more complex functions of saturation and Y-value. Though it is obvious that brightness must be very similar to saturation, the simple product of saturation and Y-value was found to correlate with brightness better than either saturation alone, or than saturation weighted by any of several other functions tried. (See Figure 8). This numerical method has been made even more objective by replacing saturation (chroma) by a similar quantity obtained very simply and directly from the tristimulus values by a method of plotting due to E. Q. Adams. The experimental proofs for this method, which we do not think is yet the final answer, will be given in another paper. But we may anticipate by saying that at least brightness is closer to the product of saturation and Y-value than it is to saturation unweighted by any function of the amount of reflected light.*

EVALUATION OF LEVELNESS.—Another application of objective color measurements is the evaluation of levelness of dyeing. Goods may be rejected for "unlevelness", dyes are evaluated for their "level dyeing" properties, yet just as in the case of tolerance specification, no objective means of specifying levelness is presently employed. Even on a perfectly acceptable dyeing, of course, the color on one portion of the cloth will differ very slightly from the color on another spot. The more noticeable these differences, the less level is the dyeing. These differences can be measured, and the degree of levelness can be related to their size and distribution.

An example of levelness measurements is given in Figure 9. Five measurements on each of two dyeings were made at equally spaced intervals. The results show, in one case, large differences in color between the individual spots on the sample, and in the other, small differ-

*Typical examples among reds are indicated by common names.

* Since this paper was written, a still better and more direct method of computing dyer's brightness from X, Y, Z has been found and will be discussed in a forthcoming paper.

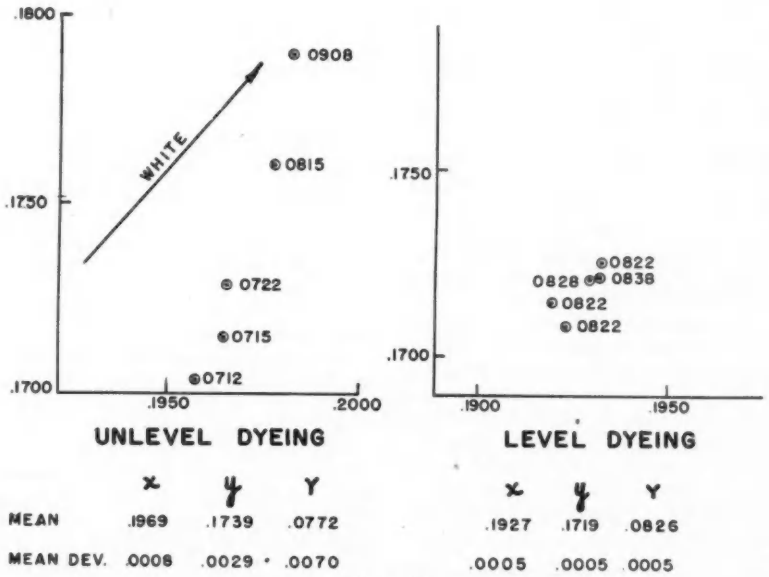


Figure 9
Measurements on Unlevel and Level Dyeings.

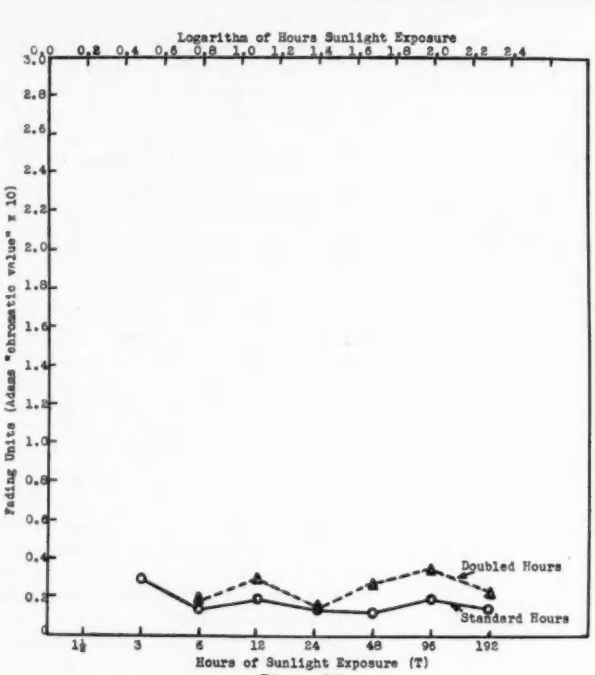

Logarithm of Hours Sunlight Exposure
Fading Units (Adams "chromatic value" x 10)
Doubled Hours
Standard Hours
Hours of Sunlight Exposure (T)

Figure 10
American Light-Fastness Standards.

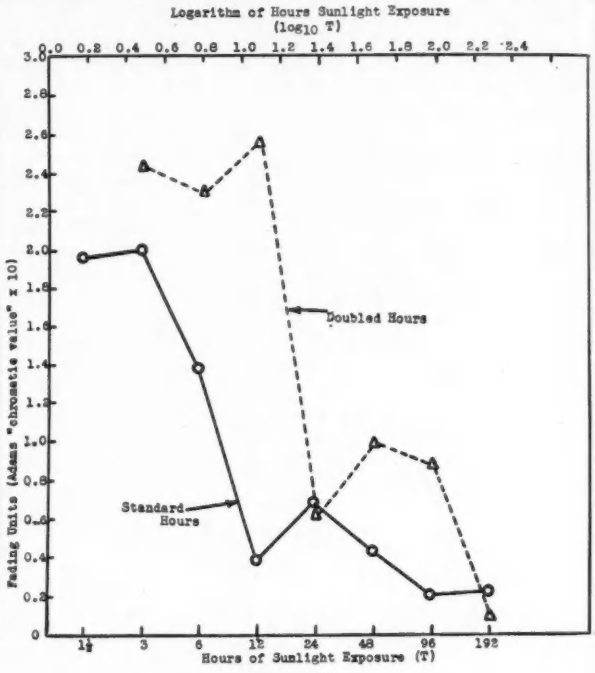


Figure 11
British Light-Fastness Standards.

ences in color. The first sample is unlevel, the second one is level. By calculating the mean value of the trichromatic coefficients and the Y value, and then calculating the mean deviation of each spot from the mean, as shown in the figure, a very simple quantitative measure of the unlevelness may be obtained. The mean deviations for the unlevel sample, it will be noted, are several times larger than those for the level sample.*

EVALUATION OF FASTNESS TESTS. —One of the best illustrations of the need for objective measurement in evaluation of fastness tests was provided by the disagreements between Americans and British concerning the uniformity of grading of American, British and German official light-fastness standards. At the request of the A.A.T.C.C. Color Committee, we have measured these standards and evaluated them.

The standards included both sunlight and Fade-Ometer exposures from 1½ to 192 hours for the former, and from 1¼ to 160 hours for the latter. They were prepared and exposed at Arlington Mills and transmitted to the writers by Dr. E. I. Stearns, Secretary of the Color Committee. Tristimulus values X, Y and Z were obtained for "Original" (O) and "Faded" (F) portions of the samples, and from these values the magnitude of the color changes, expressed as numbers of "Fading Units", were computed by means of the Adams "Chromatic Value" formula *(6)*.

Figure 10 shows the number of fading units of change in sunlight exposures of the American standards. Figure 11 shows the British sunlight exposures. It is clear how much more uniform the A.A.T.C.C. standards are. In the case of Fade-Ometer exposures also, the American set was more uniform than the British Fade-Ometer exposures. In both cases the German sets followed the same general pattern as the British. Since measurement, integration and calculation require less than five minutes, it is clear that this method for expressing fading and other fastness-test results is an economically feasible one. This method just reverses the present one in that it measures the magnitude of the fading in a given time instead of the time required to produce a given change, the somewhat dubiously definable "acceptable break". It is also independent of standards.

Conclusions

In this paper we have tried to demonstrate:

(1) There is a definite need for objectivity in color specification in textile mills.

(2) Instruments presently available are quite capable of supplying this objectivity in the solution of many problems, but cannot compete with highly skilled colorists for routine work except under special circumstances.

(3) Objective measurements are of use in classification of colors, specification of tolerance, calculation of dye mixtures, evaluation of brightness, and evaluation of levelness and fastness tests.

It has not been possible within the scope of this paper, of course, to do more than indicate a few of the many possible applications of numerical colorimetry, nor, on the other hand, to point out the limitations and difficulties which might be encountered. We hope that this brief review of the method of numerical colorimetry will be sufficient to indicate its possibilities to textile mill operators and to prompt them to consider its application to their specific problems.

(*) We are speaking here of unlevelness which occurs over an area larger than 0.25 square inches. Color changes involving less area are difficult to measure with the spectraphotometer.

(6) This formula, as used by us, is

$$F = 10\left\{ (0.23\ V_Y)^2 + [\Delta(V_x - V_Y)]^2 + [0.4\ \Delta\ (V_z - V_Y)]^2 \right\}^{\frac{1}{2}}$$

where 10, 0.23 and 0.4 are scale factors introduced to make the measures of the three color attributes agree as well as possible with visual judgments and express the fading in units of convenient size, and V_x, V_y, V_z are the Munsell "value" equivalents of the tristimulus values X, Y, Z, respectively. Adams, E. Q. JOSA 32, 168, March '42.

Mid-West Section—

THE UTILIZATION OF MEAT PACKING BY-PRODUCTS IN THE TEXTILE INDUSTRY*

DR. LEONARD J. ARMSTRONG
Armour and Company

Introduction

THE meat-packing industry is one of the major industries of the Midwest. Though we who participate in the Mid-West Section of the A.A.T.C.C. are primarily concerned in a professional way with the textile field, nevertheless the packing industry affects to some degree the lives of all of us. Its principal function is to supply us with edible meat products, but in the performance of that function it is impossible to utilize anything approaching all of the animal slaughtered. Only about 61% of the live weight of a steer can be converted into edible products; approximately 18% of the weight represents inedible products and the balance of 21% is lost in shrinkage during processing. In the case of the hog, 79% may reach edible uses, 13% inedible uses and about 8% will be lost through shrinkage.

Since 13-20% of every steer, hog, sheep and calf passing through the packing plants of a company like Armour represents inedible products, it is evident that failure to utilize those materials would result in either a higher price to the consumer for meat, or a lower price paid the farmer for his livestock.

Growth within the last 80 years of the major meat-packing companies has made it possible to collect large quantities of these waste materials. Further, it has made possible the research and the capital to determine the most efficient utilization of those inedible materials and to process them into products of value. So efficient have the large packers become in this respect that "everything is used but the squeal."

This by-product utilization program has resulted in the development of a very large number of products, many of which have been found valuable in the processing of textiles. It is of these in particular that I wish to speak.

Soaps

Perhaps the most familiar by-products of the packing industry are fats, tallows and greases. One of the earliest and still one of the most important uses for these materials is the manufacture of soap. Consequently, it was a logical step for Armour, in common with two of the other major meat packers, to enter the soap manufacturing field. In addition to their own soap manufacturing activities, the packers supply a huge volume of uniform soap stock to the "Big Three" of the soap industry. Efficient collection, grading and handling of fat by-products by the packing industry has made possible the uniform quality of many of the soap products we purchase and use. Although in recent years large quantities of vegetable oils such as soybean, cottonseed and corn oils have been utilized in soap manufacturing, it is noteworthy that the two grades of soap which have continued to be standard in the textile processing field (namely, the 41-42° titer tallow chip and the red oil flake) are obtained as by-products of the beef packing industry. Prime-tallow serves as raw material for the 41-42° titer chip. The base of the red oil flake (commercial oleic acid) is obtained by splitting tallow into a mixture of fatty acids and glycerine. The fatty acid portion is chilled and pressed to provide liquid red oil and a solid cake of stearic acid. The most modern operation substitutes crystallization for pressing to obtain the highest purity red oil and stearic acid.

When soap is mentioned today, the subject of synthetic detergents also seems certain to arise. Obviously synthetic detergents compete to a degree with soap. Yet in the textile field, which originally fostered the growth of synthetic detergents, both types of product are now assuming their proper positions. The enormous amount of experimentation occasioned by the erratic fat and oil market during the past two years has brought forth the conclusion that, on the basis of a normal market and within the limitations imposed by hard water and acid conditions, soap possesses scouring and finishing properties unequalled to date by synthetic detergents. Actually, many of the synthetic products are based on natural fats and at least one of the detergents most widely used in textile operations employs red oil as its base. The packing industry, therefore, has much the same interest in successful marketing of synthetic detergents that it has in soap.

Chemicals

Stearic acid, produced together with red oil and glycerine from tallow, provides a base for many of the finishing softening treatments given to cottons and rayons. The stability toward heat of its sodium and ammonium salts, as well as its newer nonionic esters, has not been

* Presented at the Midwest Section Meeting, Bismarck Hotel, Chicago, Ill., September 24, 1949.

approached to date by the hydrogenated vegetable oils. Similarly sulfonated tallow, another old standby, enjoys wide popularity not only as a finishing agent but as a warp sizing lubricant. Its resistance to yellowing, rancidity and odor development, as well as its excellent lubricant and softening characteristics, have served to maintain its position.

The stability to heat and aging of the tallow fatty acids has led to widespread chemical developments both within and outside the packing industry. The textile chemical suppliers have made them the base of most of the newer nonionic and cationic softening agents introduced during the last 10 to 15 years.

The relative chemical reactivity of the animal fats and oils has made possible the development in recent years of a new group of textile finishes, the durable water repellents. These permit fabrics to "breathe" by allowing circulation of air and evaporation of perspiration, yet they are resistant to laundering and drycleaning and do not need re-application after each cleaning. The lead in supplying fatty intermediates for such applications has been taken by the packing industry, specifically in this instance by Armour and Company, and has resulted in the entry of packing companies into the truly chemical field.

This position has been strengthened even further by developments within the packing industry such as Armour's fatty acid fractional distillation processes, whereby it is now commercial reality to separate pressed "stearic" acid (actually a mixture of palmitic and stearic) into its commercially pure components. In many instances these components impart characteristics appreciably different from the pressed acid. This fractional distillation process permits recombination of commercially pure fatty acids in any proportion desired, tailor-made for any specific use. Further, it utilizes many of the lower grade fats and foots which would otherwise be of little value.

Glycerine

Soap, fatty acids and their derivatives are by-products of the packing industry. Glycerine is truly a by-product of the soap and fatty acid industry. Its recovery from the soap making process or fat splitting process is very important to the soap manufacturer. Of the common fats used in soap making, some 10% is glycerine. Since the price of glycerine is substantially above that of soap, its loss or recovery has a decided effect on the price of soap. In the textile field it is generally employed for its hygroscopic action, being particularly valuable in keeping printing pastes workable.

Lard Oil

We have noted previously that a somewhat smaller proportion of the weight of a hog to that of a steer represents inedible products. In part this is due to the large percentage of hog fat utilized in edible lard. However, pressing of unbleached lard yields lard oil, just as the pressing of tallow yields tallow oils and the pressing of tallow fatty acids produces red oil. Lard oils have found use in the textile field for years as fiber lubricants, particularly in the woolen and worsted industries. Despite the advent of the sulfonated vegetable oils and the cheaper mineral oils, lard oil has retained its reputation in this field for outstanding stability during storage of goods and ready scourability with soap and soda ash. Blending with cheaper oils is commonly practiced to extend its usefulness.

Hair and Wool

Hair is a commodity obtained in considerable quantity by the packing industry. The most familiar member of this group is, of course, pulled wool. Its production represents approximately 20% of our wool supply. Proper handling of the pelts to avoid bacterial decomposition and careful use of the "paint" provide pulled wool which can be used for most purposes to which shorn wool is put. In many instances pulled wools are preferred, because the pullers furnish carefully graded stocks exactly suited to the manufacturer's use. Pulled wools are particularly useful for soft twist knitting yarns because the fibers do not cling together as closely in drafting and twisting. Blanket mills use large quantities of the finer grades because of their generally longer staple.

Hog hair and cattle tail hair are used together with horse mane hair and horse tail hair in the production of curled hair. Production of this by-product is of interest because it is the only operation where the packing industry uses textile processes, and although the end-product is not used in a textile manufacturing operation, it is used in conjunction with textile fabrics. After necessary washing, sterilizing, dyeing and blending operations, the hair is spun into a rope and the twist set. After opening, the resulting curled hair finds use as a filler in mattresses, furniture cushions and automobile seats. Curled hair is further processed into rubberized curled hair pads whereby it becomes competitive in the automotive industry with foam rubber.

Glue

The packing-house by-products from which glue is derived comprise hide trimmings, tannery scrap, bones, fleshings and sinews. In the industry glue is referred to as hide glue or as bone glue, depending on the source from which it is derived. Within each classification are various grades depending upon the jelly strength and viscosity of the particular lot.

Hides are normally prepared for glue extraction by liming, whereas bones must be crushed to make the glue available for extraction. The actual extraction operation is carried out with hot or boiling water or under pressure. Bones yield glue much more slowly than hide stock because of the large amount of mineral matter present in them. Consequently bone glue must be extracted under considerably more severe conditions, with greater degradation of bone glue protein. Hide glues are therefore the higher grade glues.

Hide glue or inedible gelatin (the terms are nearly synonomous) has found widespread use in recent years for warp sizing of acetate rayon, this use accounting for an appreciable amount of the total production. Smaller quantities are used for viscose and silk. The very highest grades of hide glue are used by the throwster in preparing yarn for crepe manufacture.

The lower grade bone glues are used because of their colloidal properties as retarding agents in the application of vat dyestuffs. The action of glue is readily controlled and it is invaluable in the application of some of the more sensitive colors.

Blood Albumin

Blood albumin finds utility in the textile field as a mordant in the printing of cotton goods.

Its manufacture involves separation of the blood serum from fibrin and hemoglobin and concentration of the serum to the albumin.

Conclusions

In carrying out its primary function of providing society with edible meat products, the meat packing industry supplies a wide variety of raw materials and auxiliaries for the processing of textiles. Fortunately, in supplying basic textile industry requirements, it has been able to utilize otherwise waste products and reduce the cost of food to the public. There is every reason to believe that continuing research and development in packing-house by-product utilization will lead to further reduction of those costs and a greater number of useful products for the textile industry and others.

Hudson-Mohawk Section—

SURFACE-ACTIVE AGENTS*

B. J. GARCEAU

Arnold, Hoffman & Co., Inc.

PERHAPS no other field of chemical specialties has become so diversified or achieved more universal application than that of surface-active agents. Since the first use of soap, development has proceeded through the early sulfated oils and fatty acids to the many products that we know today. These products are now grouped into three general classes: anionic, cationic and nonionic. Within these classes, there exist wetting and rewetting agents, detergents and emulsifiers.

Regardless of the class or use, the function involved is the same (e.g., that of lowering the surface or interfacial tension between two phases, a liquid and a solid, liquid and a gas, or two liquids). They promote contact, mingling or wetting between two ordinarily incompatible materials, such as oil and water, by altering this incompatibility at the contact surface. These properties are achieved by combining, in the molecule of a surface-active agent, a water-seeking or hydrophilic portion and an oil-seeking or lipophilic portion. The lipophilic portion is always represented by an oil soluble hydrocarbon or fatty oil chain, and the hydrophilic by a water soluble or polar group such as sulfate or sulfonic, metallic ion, hydroxyl radical or one of many others.

Roughly speaking, one part of the molecule dissolves in the oil or lipoid phase and the other part in the aqueous phase, bringing the two together. Furthermore, surface-active agents, because of this molecular composition, tend to concentrate at the surface or interface and orient themselves with the oil-seeking portion outward and the water-seeking portion in the water. Thus, still roughly speaking, they are poised to grasp incompatible substances such as oily cotton fibers, wet them with the oil-seeking portion, and draw them into the water phase with the water-seeking portion. This explains the remarkable effectiveness of small concentrations of 0.1 to 1.0% dilutions in water. This property is essential, whether the function involved is that of wetting, scouring or emulsifying.

Figure 1 is a graphic illustration of the make-up of molecules of surface-active agents, the manner in which they concentrate at the surface, and the way in which they enter an oil droplet and suspend it in water.

However, for detergents and emulsifiers many other properties are brought into play. Briefly, the detergent must sorb onto the particle of dirt after wetting the oily film present, suspend it in the solution, and hold it there in stable suspension to prevent redeposition. In general most of the better wetting agents have too great solubility, and lack this colloidal suspending property necessary to make good detergents. While they frequently are effective for oil removal, they do not suspend the soil particles effectively. Thus many detergents are good wetting agents, but very few of the most efficient wetting agents are good detergents.

Emulsification is perhaps the most exacting operation of the three. Once again, the same functions involved in scouring and wetting are essential, but due to the variety of materials emulsified, the solubility of the lipophilic portion of the agent in the substance to be emulsified becomes an important factor. It is safe to say that a good emulsifier should be tailor-made for the job involved. There are many theories on the how and why of emulsions. The most popular of these is the adsorption theory.

When two incompatible surfaces are brought together (such as oil and water) the surface-active agent is adsorbed at the common surface or interface. This forms an emulsifying film at least three molecules thick—one of water, one of surface-active agent and one of oil.

There will be two surfaces of the emulsifying film with one toward the water and one toward the oil. If the surface-tension of the water-agent interface is less than that of the oil-agent interface, the film will tend to curl so as to be convex on the water side, forming a droplet of the oil surrounded by water, and giving an oil-in-water emulsion. If the reverse is true, the water is formed into droplets and a water-in-oil emulsion is formed with oil the outside phase.

Figure 2 shows the film, three molecules in thickness. The lower left diagram illustrates the formation of a droplet of oil suspended in water (oil in water emulsion) due to a greater reduction in surface tension at the water-agent interface. The lower right diagram illustrates the reverse effect forming a water in oil emulsion.

There are many other theories on the subject, such as the hydration theory, the oriented adsorption theory and the elec-

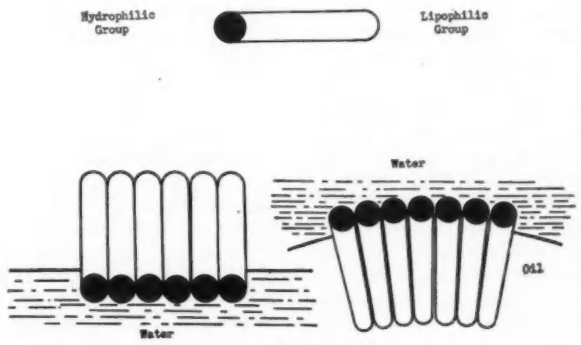


Fig. 1

* Presented at meeting, Hudson-Mohawk Section, Sept. 23, 1949.

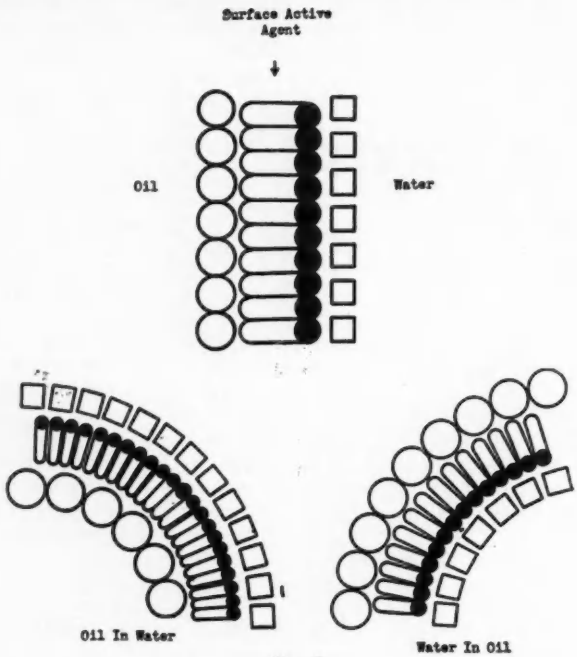


Fig. 2

trokinetic theory, to name a few. They all possess some merit and possibly are closely inter-related. Consequently, the problem of emulsifying any particular substance perfectly is again a question of obtaining the proper balance of the right lipophilic portion, with a hydrophilic group for the substance to be emulsified.

As an example, light mineral oil can be emulsified well with a compound consisting of one mol of red oil condensed with five mols of ethylene oxide. If the hydrophilic chain is increased to twenty mols of ethylene oxide, however, it will not work. For emulsification of red oil in water the reverse is true. The compound with the strong hydrophilic group emulsifies red oil well, while the one with the five-mol chain does not work.

Coming back to detergency once again, many studies are being carried out today to explain the how and why of detergents. The problem is complex because of the functions involved. In this operation three interfaces are involved —air-liquid, liquid-liquid and solid-liquid. The variety of materials scoured involves selection of a detergent with proper wetting action on a particular substance.

Using cotton as an example: a detergent must exhibit preferential wetting of the cotton fiber itself. This brings about displacement of the oil from the fiber by reduction of surface tension. Then the emulsification and suspending properties of the detergent are brought into play to complete the job.

This explains the necessity of building a good many of the synthetic detergents by addition of salts and alkali to overcome deficiency in one or more of the required properties.

Figure 3 shows a fiber coated with an oil film in water suspension. Angle A is the contact angle. The solution preferentially wets the fiber, and the lower diagram illustrates the reduction of the contact angle as the oil is lifted off in a droplet by the action of the surface active agent in solution.

It is evident that this description of detergency is rather sketchy, but the main point is that the inherent properties of the surface-active agent must operate in a given direction, and the aggregate effect in this direction produces a cleansing action when in proper balance.

Returning to the three general classes of surface-active agents (anionic, cationic and nonionic) the anionic can be further divided into two groups: those with a terminal hydrophile group and those with the hydrophile group in the middle. The following is a general classification of the most prominent compounds:

ANIONIC—TERMINAL GROUP

1. Soap
2. Sulfated Fatty Alcohols
3. Sulfated Fatty Amides
4. Aryl Alkyl Sulfonates

ANIONIC—MIDDLE HYDROPHYLIC GROUP

1. Sulfated Fatty Acids
2. Sulfated Natural Oils
3. Sulfated Synthetic Fatty Acid Esters
4. Aryl Alkyl Sulfonates

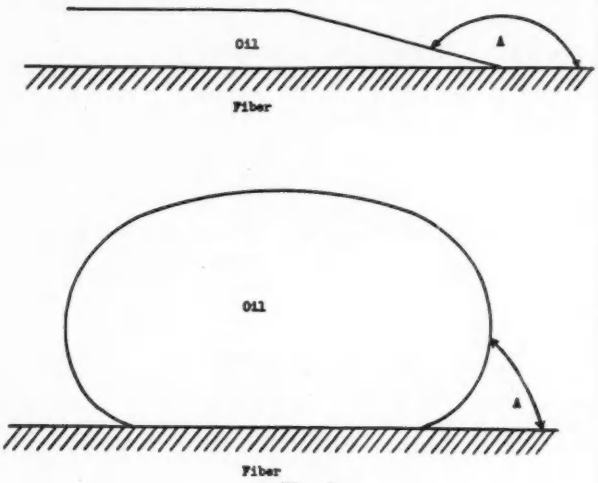


Fig. 3

CATIONIC

1. Quaternary Ammonium Compounds

NONIONIC

1. Ethylene Oxide Condensates of Fatty Acids, Alcohols and phenols
2. Polyethylene Glycol Esters of Fatty Acids
3. Polyhydroxy Alcohol Esters of Fatty Acids

The aryl alkyl sulfonates can be listed as either the terminal or middle hydrophile type depending on the number or length of alkyl side chains.

The following lists general formulae of some of the more common types:

ANIONIC—TERMINAL HYDROPHILE GROUP

1. Soap

$$CH_3CH_2....COONa$$

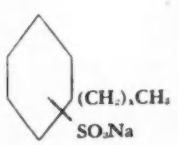
2. Gardinols

$$CH_3CH_2....CH_2OSO_3N_2$$

3. Igepon

$$CH_3CH_2....CON(CH_3)—C_2H_4\ SO_3Na$$

4. Aryl Alkyl Sulfonates



ANIONIC—MIDDLE HYDROPHILE GROUP

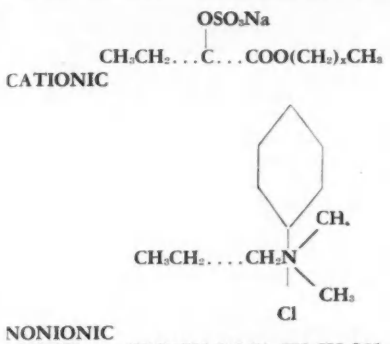
1. Sulfated Red Oil

$$CH_3CH_2....\underset{\displaystyle OSO_3Na}{\underset{|}{C}}....COONa$$

2. Sulfated Olive Oil

$$CH_3CH_2....\underset{\displaystyle OSO_3Na}{\underset{|}{C}}....COOCH_2$$
$$CH_3CH_2....C....COOCH$$
$$CH_3CH_2....C....COOCH_2$$

3. Sulfated Synthetic Esters



The position of the hydrophilic group in the anionic types determines its wetting or detergent efficiency. As a rule, those with the hydrophilic group in the terminal position, such as soap and sulfated fatty alcohols, are good detergents. The compounds with the hydrophilic group in the central position are the best wetting agents. Consequently, if it were economically possible to build the chemical compounds carbon by carbon, it would be quite possible to make the perfect wetting agent or detergent with respect to any desired polar group. However, since we have to start with commercially available chemicals, we now have a host of surface-active agents, each with its own properties, both good and bad.

Ordinary soap, the original chemical surface-active agent, while still probably the best all-around detergent in use has several failings. In the presence of acid it splits to insoluble fatty acid, and it is easily precipitated by hard water with formation of insoluble lime or magnesium soap.

Sulfated oils, olive and castor, were the next development in the field. These were an improvement over soap in that the sulfuric acid esters formed in the presence of mild acid were still water soluble. These compounds also exhibited more resistance to hard water. The variety and complexity of the available products of this type is due to the fact that with most commercial methods of sulfation the percent sulfation and the percent hydrolysis can be varied greatly. A high combined SO_3 content or sulfation will usually increase the wetting properties while a high hydrolysis, in which the glycerol ester is split back to the fatty acid, will give a product with greater emulsifying, rewetting and detergency properties. This is due to the soap formed by neutralization.

Sulfated fatty acids (such as sulfated red oil) are normally poor wetting agents, but because of the high amount of soap present, they have fairly good rewetting properties; in the presence of alkali they have fairly good detergent properties.

The sulfated synthetic esters of fatty acids are the most interesting of the sulfated fatty base types, as far as wetting is concerned. The fatty acids, when esterified with a low molecular weight alcohol and sulfated, have a much better hydrophobic-hydrophilic balance and are very good wetting agents. These esters have a lower freezing point than the natural oils and can be sulfated at lower temperatures, giving very low hydrolysis and high degree of sulfation. This produces almost perfect balance for the particular compound. Consequently these products have fairly good resistance to acids and hard water, and fair resistance to salt. However, since they are fatty esters, they are subject to saponification and their resistance to alkali is low.

The most significant property of this group is rewetting. Combined with their excellent wetting efficiency, these properties are ideal for high speed operations wherein wetting and rewetting are vital (e.g., Sanforizing). There are also many other applications for this property. For example, absorbent bleached or dyed material can be obtained from unscoured fabric or yarn by incorporating one of these agents in the peroxide bleach bath or dyebath. While not truly substantive, these agents are adsorbed by the waxes and oils present and tend to make them soluble or wettable, even after drying. The addition of a small amount of a salt such as sodium sulfate aids this adsorption and very small amounts of agent are required.

These sulfated synthetic fatty esters are also used for ordinary wetting applications, dyeing assistants, and in finishing compositions. In general, they will do everything the sulfated oils will do, and with the exception of softening and lubrication, will do a better job with less agent.

The aryl alkyl sulfonates represent the largest group of surface-active agents other than soaps that are commercially available. Basically, they can be classified either as wetting agents or detergents. Starting with aromatic compounds such as benzene, naphthalene or toluene, alkyl side chains from 2 to 14 carbons are incorporated and the resulting compounds sulfonated. These products, because of their low cost, are used whenever a general wetting operation is involved. They are very good wetting agents but will not rewet well and they have no softening or lubricating properties. However, they possess excellent detergent properties when built with sodium sulfate and alkali. The aryl alkyl sulfonates possess good resistance to acids, alkali and salts, and in 2% concentrations of these chemicals the wetting efficiency is actually improved. Hard water improves the scouring efficiency of many of these products and they will not hydrolyze in the presence of acid.

Since the source of raw material for this group is the petroleum industry, the volume produced is very high and the cost comparatively low. However, their wide acceptance is based on their performance in certain operations and not entirely on price.

The only other fairly large group of anionic agents is that of the sulfated fatty alcohols. These compounds have a terminal hydrophile group and are usually used as detergents and dispersing agents. They are extremely stable compounds and work well in the presence of acid, alkali or salt. Another important feature is their softening property on textile fibers.

The sulfonated fatty amides, the last of the anionic classification mentioned, are very similar to the fatty alcohols in properties and uses. Likewise, they are more expensive than the aryl alkyl types.

This is not a complete listing of all the anionic agents available today. However, it includes those that can be classified into groups with properties considered in a general way.

The cationic surface-active agents available to the textile trade are few in number. As in substantive softeners, the hydrophilic group is a quaternary ammonium group and consequently the properties are the same. Probably the only difference lies in a shorter hydrocarbon chain, giving greater solubility and more wetting ability through proper balance in the compound. These products are substantive and are incompatible with anionic compounds. They work best at a slightly acid pH and their use is closely controlled by these three properties.

The final class to be covered, nonionic surface-active agents, is the latest development in the field. In the search for perfect compounds with respect to lipophilic-hydrophilic balance, the nonionics are ideal. The hydrophilic chain is in most cases a polymer of an oxygen or hydroxyl compound and can be varied at will. Consequently, starting with any particular fat, fatty alcohol, or phenol compound, the water soluble part of the chain can be built block by block until the desired balance is obtained.

In general, these products are very good detergents and wetting agents. Their resistance to salts is phenomenal; in some cases as high as 20% solutions of sodium chloride or calcium chloride can be tolerated. Their resistance to acid and alkali depends on the particular base from which they are made, but in most cases acids in cold solutions and low amounts of alkali are compatible. Compared to

the anionics they are fairly expensive, but if the operation involved is that of scouring, the small amounts required make up for the difference in price. Their maximum efficiency is usually in very low concentrations. One peculiarity of these compounds is their lack of foam, as compared to soap, in detergent operations. This has been one of the main objections of the trade to their use, and has necessitated an educational program on the part of the manufacturer. The number of products of this type on the market is rapidly increasing, and on their merit they are finding their place in the surface-active agent field.

As an example, one specific use in which they have proved superior to the other types is in the desizing of cotton. Used as wetting agents in conjunction with enzymes, they speed desizing and make it more efficient.

The aryl alkyl sulfonates destroy the enzyme almost completely. The sulfated fatty acid esters, while they will work, have a harmful effect on the enzyme, destroying probably about 25-30% of it.

The nonionics tested proved harmless to the enzymes. Their detergent action in desizing followed by a scour makes them doubly advantageous for this operation.

In conclusion, a classification such as this is very general. Through possible variation in combined SO_3 content from one product to another, and the particular starting material used, any one specific product on the market assumes individual characteristics and has to be judged accordingly. Consequently, in selecting an agent for use in any particular operation for a desired result, the exact conditions of that operation must be considered. Secondly, the class of compounds best suited for those conditions and desired result can be chosen. From there on, the agents of this group must be tried and compared for the maximum results at a minimum cost before the final selection can be made.

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Dyeing Test—

(Concluded from Page P77)

ployed to indicate that the spotting of cotton is not necessarily accompanied by excessive immaturity. The test was of value in the diagnosis of the source of difficulties with excessive neppiness encountered by a mill. It showed that the cottons being used, which were thought by representatives of the mill to be the source of the trouble, were coarse-fibered as well as being above average maturity and consequently would not be expected to produce an abnormal number of neps. Further, the dye test indicated to mill representatives that the purchase and use of higher grades of cotton did not necessarily insure correspondingly better fiber development.

Differential dyeing has been applied successfully to indicate effectiveness of blending, to check on the production of neps during processing, and to indicate the nature of fibers in the waste. Examination of dyed stock and waste samples taken at the principal stages of yarn manufacture showed that the combing operation was the only process which produced a tendency toward the selective removal of thin-walled, immature fibers as waste.

The dye test and the Micronaire have both been employed for identifying cottons likely to produce neps. To establish the relationship of maturity by the dye test and fineness by the Micronaire, two groups of samples were classified by both techniques. Simple correlation of 70% and 51% were obtained with these two groups of samples. Since the production of neps is influenced by maturity more than by any other single fiber property, the dye test would appear to be more reliable for identifying cottons likely to produce neps than Micronaire fineness which has less relation to maturity.

Acknowledgments

The Committee wishes to express appreciation to the personnel of the following organizations for their excellent cooperation and assistance:

Pepperell Manufacturing Company.

West Point Manufacturing Company, Research Division.

Callaway Mills Company, Research Division.

Southern Regional Research Laboratory.†

† One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

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Report of the Utica Technical Institute Student Chapter

THE Utica Technical Institute Student Chapter held its regular meeting on Thursday, January 12, 1950, with chairman Robert Zarnoch presiding.

William A. Nelson, Chief Chemist of the Ritter Chemical Company and Secretary of the Hudson-Mohawk Section was guest speaker. He addressed an audience of thirty members and potential members of the Chapter and spoke on the background, function and the importance of the A.A.T.C.C. in the textile industry. The students and the instructors were congratulated by Mr. Nelson for their fine work in the development of the youngest chapter of the parent organization.

Mr. Nelson extended to the chapter an invitation to attend the March meeting of the Hudson-Mohawk section which is to be held in Utica.

A buffet supper followed the meeting.

Respectfully submitted,

ARMAND DI MEO, *Secretary*

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

50-1

Education: M.S., Textile Institute.

Experience: One year in cotton finishing research laboratory.

Age 29; married; references; research or production in New England preferred.

1-23, 2-6

50-2

Education: New Bedford Textile Institute.

Experience: 16 years chemist, dyer and superintendent, cotton and rayon dyeing and finishing.

Age 40; married; references; position as superintendent or demonstrator in eastern U. S. preferred.

2-6, 2-20

49-40

Education: A.B., chemistry, Cornell; finishing course at Philadelphia Textile Institute.

Experience: two years, asst. in dyehouse and one summer in laboratory.

Age 25; married; references, South preferred.

2-6, 2-20

Winter Meeting, Mid-West Section

THE Winter Meeting of the Mid-West Section will be held at the Bismarck Hotel, Chicago, Illinois, on Saturday, February 18.

The afternoon session will feature the showing of a colored moving picture with sound, entitled *Cuprofix,* and will be presented by the Sandoz Chemical Works, Inc. A qualified representative of this company will be present to answer questions at the conclusion of the film showing.

Dinner will be served at 7:00 p. m.

The speaker of the evening will be R. W. Jacoby, manager of the Providence office of the Ciba Company, who will speak on "Current Developments in Textile Processing." He represented the Rhode Island Section and presented their intersectional paper, *The Influence of Electrical Charge in the Application of Dyestuffs,* at the Twenty-Fifth General Meeting in Chicago in 1947.

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Meeting Report, New York Section

A NEW record for attendance at a local section meeting was set at the January 13th meeting of the New York Section at the Hotel New Yorker. There was a total of 625 in attendance, including many from other sections.

Charles W. Dorn, Chairman, introduced a number of national officers who were seated at the head table as follows: Dr. Harold W. Stiegler, National Director of Research, Dr. Harold C. Chapin, National Secretary, J. Robert Bonnar, National Chairman of the Research Committee and the Executive Committee on Research, George O. Linberg, National Vice-President, Henry F. Herrmann, National Past President, and C. Norris Rabold, National President.

Mr. Herrmann referred to the 1934 National Convention which was held in the same room and pointed out that the attendance for that national meeting was smaller than the attendance at this local section meeting. He introduced Mr. Rabold who stressed the fact that his administration intended to continue to pursue vigorously the research program, to encourage student programs, and to further foreign relationships.

Mr. Dorn announced that the following committee chairmen had been appointed for the 1951 National Convention, to be held under the auspices of the New York Section: Charles W. Dorn and Paul J. Luck, *General Co-Chairmen;* Henry L. Young, *Exhibits;* William A. Holst, Jr., *Technical Program;* Herman E. Wilde, *Entertainment nad Equipment;* Weldon Helmus, *Banquet:* Leonard S. Little, *Thursday Luncheon;* Ernest Hart, *Reception;* John H. Hennessey, *Registration and Finance;* Dr. Herman E. Hager, *Ladies;* Samuel A. Pettus, *Transportation;* Kenneth A. Howry, *Publicity;* Norman A. Johnson, *Printing.*

Dr. Leonard E. Ravich, Vice-President in Charge of Research, Vat-Craft Corporation, presented a paper on "Photochemical Dyeing" which was illustrated with slides. This was the first presentation of technical information on this process. Following the presentation Mr. Dorn announced that persons who wished to see the Vat-Craft process in operation could do so on any Thursday by first making an appointment with the Vat-Craft Corporation.

Respectfully submitted,
NORMAN A. JOHNSON, *Secretary*

CALENDAR

NATIONAL CONVENTIONS

1950: September 28 to 30, Portsmouth, N. H.
1951: October 18 to 20, Statler, New York
1952: Boston.

MID-WEST SECTION

Meetings: Feb. 18 (Bismarck Hotel, Chicago), May 6 (Schroeder Hotel, Milwaukee, Wisc.).

NEW YORK SECTION

Meetings: Mar. 3 (Hotel Statler, New York), April 14, May 5 (Kohler's Swiss Chalet, Rochelle Park, N. J.), June 16—Outing.

PHILADELPHIA SECTION

Meetings: February 24, March 31, May 5 (Kugler's, Philadelphia), June 9 (Annual Outing, Torresdale Country Club, Philadelphia), October 13, December 8, January 17, 1951.

PHILADELPHIA TEXTILE INSTITUTE STUDENT CHAPTER

Meetings: March 1, March 29, April 26, and May 24.

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Meetings: April 1 (Robert E. Lee Hotel, Winston-Salem, N. C.), June 30-July 1 (Ocean Forest Hotel, Myrtle Beach, S. C.).

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Meeting: February 18, (Hotel Patten, Chattanooga, Tenn.)

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Meetings: Feb. 25 (Talladega, Ala.), May 27 (Columbus, Ga.), Sept. 23 (LaGrange, Ga.) Dec. 9 (Atlanta, Ga.)

WESTERN NEW ENGLAND SECTION

Meetings: March 10 (Waterbury, Conn.), April 14 (Rapp's Restaurant, Shelton, Conn.) May 26 (Waverly Inn, Cheshire, Conn.) June 23 (Outing at Wallingford, Conn. Country Club).

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ABSTRACTS

Fungicidal Activity of Bisphenols

Paul B. Marsh, Mary L. Butler and Bernice S. Clark, Industrial and Engineering Chemistry, page 2176, Vol. 41, No. 10, October, 1949.

In continuation of experiments previously reported, thirty-nine additional bisphenols have been tested for fungicidal activity as mildew preventives on cotton fabrics, bringing the total number of compounds tested to seventy-three. Some of these compounds are much more effective per unit weight on fabric than others as fungicides, and the trend toward high activity is correlated with certain features of chemical structure. The data do not appear to warrant the selection of any single bisphenol from among the group tested as having unique high potency but suggest rather that high potency is related to a certain generic type of structure within the group. For convenience in presenting the data, 2,2'-methylenebis(4-chlorophenol) has been selected arbitrarily from among the more active compounds and used as a point of reference for comparison with other compounds in both activity and chemical structure. Bisphenolic bridges consisting of $—CH_2—$, $—CHCH_3—$, $—CHC_6H_5—$, $—CH=CH—$, and —S— have been found compatible with high activity, whereas —SO— or $—SO_2—$bridges are much less satisfactory. The presence of halogen atoms in all four positions ortho to the bisphenolic hydroxyls is consistently accomplished by low activity. Bromine has been found less desirable from the standpoint of fungicidal potency than chlorine in bisphenols of high total halogen content. Bisphenols with a chlorothymol type of structure, with unusually high molecular weights, a complete lack of halogen, or ether linkages blocking both phenolic hydroxyls have been found low in activity.

Viscose Processing of Cellulose: Changes in Basic Properties

R. L. Mitchell, Industrial and Engineering Chemistry, page 2197, Vol. 41, No. 10, October, 1949.

Changes in degree of polymerization, α-cellulose, carboxyl, and pentosan content which occur during the steeping, aging, xanthation, and spinning stages of viscose processing are shown for several pulps of different initial degrees of purity. Special consideration is given to depolymerization reactions since the permanent drop in degree of polymerization has perhaps the greatest effect on the other basic analytical properties of the cellulose. Some effects of time, temperature, and oxygen concentration on the extent and type of alkaline degradation are shown. The presence or absence of oxygen may be the factor determining which of the two types of alkaline degradation will occur. A special recovery technique is described for retaining low degree of polymerization gamma constituents as the water-insoluble nitrate derivatives.

The Fine Structure of Cotton Fibers from Density Measurements

Helmut Wakeham, Textile Research Journal, page 595, Vol. XIX, No. 10, October, 1949.

Research on the apparent densities of cellulose fibers in different liquids gives information concerning inner fiber structure which may be useful in characterizing certain desirable properties of cotton fibers. This report describes an investigation of some factors involved in evaluating density data in terms of fiber structure. The interpretation is made of some experimentally determined densities of cotton and rayon fibers in benzene and in dioctyl phthalate—two liquids differing greatly in molecular dimensions—and in mercury, a nonwetting liquid. In the last case, the "over-all density" of a fiber, defined as the average density of all material within the outer wall of the fiber, is determined by a method utilizing a mercury-pressure volumenometer.

In the case of the wetting liquids, higher densities were obtained with benzene—which has the smaller molecule; this indicates that the fibers have pore spaces which in size approach the dimensions of the molecule. When the cotton fibers are cut into short sections, about 1 mm. long, more of these pores and intrafiber channels are open to the liquid medium; a higher density is, therefore, obtained for the cut fibers than for the whole fibers. Pore-space values within the fiber are calculated and compared with values obtained by other methods. The significance of these observations in the consideration of fiber structure is discussed.

Cottonseed Protein Fiber

Jett C. Arthur Jr. and Hugh G. Many, Textile Research Journal, page 605, Vol. XIX, No. 10, October, 1949.

The laboratory-scale extrusion of relatively highly concentrated dispersions of cottonseed protein is reported, together with some of the properties of the resulting fiber. These fibers have a dry strength of 0.6 to 0.7 grams per denier and a wet strength of 0.2 to 0.3 grams per denier. They are yellow-to-orange in color and have a soft hand.

The Autoxidation of Alkali Cellulose—Part II

D. Entwistle, E. H. Cole and N. S. Wooding, Textile Research Journal, page 609, Vol. XIX, No. 10, October, 1949.

The previous paper in this series (see abstract, REPORTER, page 803, October 31, 1949 issue) discussed the uncatalyzed autoxidation of alkali cellulose and suggested that the reaction proceeds via a chain mechanism involving transient free radicals. The present paper describes the effect of certain transition metal catalysts on the kinetics of oxygen absorption and cellulose depolymerization. It is further shown that the reaction is subject to catalysis by substances which generate free radicals and by the presence of certain other autoxidizable substances. Silver and gold compounds behave as inhibitors, as do some typical organic antioxidants. The results provide further evidence for the free-radical chain character of the reaction. Possible depolymerization processes are discussed in terms of this approach.

Cellulose Studies

XI. Acetal Type of Methoxyl Groups in Methanolyzed Celluloses

P. C. Mehta and Eugene Pacsu, Textile Research Journal, page 625, Vol. XIX, No. 10, October, 1949.

Native cotton and commercial viscose rayon were degraded by using a saturated solution of hydrogen chloride (about 43%) in methanol at 0°C. It was found that, on the average, 8.1 bonds in native cotton suffered methanolysis during the first 6 hours of the reaction, whereas in the ensuing period of 666 hours only 1.6 bonds became cleaved. The results indicate that the initial reaction comes to a practical standstill after about the same stage of degradation has been reached as in the mild hydrolytic scission of the same materials (D.P.—250 for cotton, and D.P.—60 for viscose rayon).

In order to gain information as to the nature of the methoxyl groups in the methanolyzed products, a study of the rate of hydrolysis of the latter was made.

Evidently, if the classical concept of cellulose structure is correct—that is, if only normal methyl glucopyranoside end-groups are present—then the rate of acid hydrolysis, as measured by the increase in the reducing power, should be of the order of magnitude shown by the normal methyl glucopyranosides. On the other hand, a very fast rate of hydrolysis, which is characteristic for the open-chain dimethyl acetals of the sugars, would constitute evidence for the presence of such types of residues; hence, it would favor the new concept of cellulose structure.

The results showed that more than one-half of the material in the case of viscose rayon and about one-half in that of native cotton were hydrolyzed by 0.05N HCl at 60°C. in a period of 48 hours, which is shorter beyond all comparison than the half-life (3,450 hours) of methyl α-glucopyranoside under identical conditions. These results are considered to supply the chemical proof for the presence of the acid-sensitive, open-chain glucose residues which were suggested in the new formula for cellulose.

Levelness of Acid Wool Dyes: The Application of Laboratory Tests to Production

E. A. Leonard, G. A. Lathrop and E. P. Mersereau, Textile Research Journal, page 638, Vol. XIX, No. 10, October, 1949.

A quantitative laboratory method for evaluating levelness of acid wool dyes is described. The procedure consists of running half of a normal yarn-dye circle and then making additions of white yarn and dye liquor equal in amount to those in the original batch. The second half of the cycle is then run, and the yarns are removed. Reflectances of the two dyed yarns are determined on a G. E. recording spectrophotometer and a "levelness index" is calculated as the ratio of dye concentration on the yarn added at the mid-point of the cycle to that on the yarn started at the beginning of the cycle.

The technical beckground of the test method is outlined and the results of tests on representative dyes are tabulated. It is shown that the test method has sufficient flexibility to permit examinations of the effects of dyeing variables on levelness. An example is cited showing the effect of salt concentration on levelness on Alizarine Green CG Ex. (C.I. 1078).

The example above is applied to plant production, and the levelness of 500-pound Hussong stock-dyed batches is evaluated by spectrophotometer reflectances, converted to dye concentration, of stratified samples from the batches of stock. It is shown that the coefficient of dye concentration variation among the 8 samples from a plant batch is proportional to the laboratory "levelness index".

Examination of Textile Fibers by the "Dispersion Staining" Method

Pritchard C. Douglass and Germain C. Crossmon, Textile Research Journal, page 644, Vol. XIX, No. 10, October, 1949.

The "dispersion staining" method is used for observing textile fibers in colors which aid in the determination of their structure and in their identification. Fibers which are classified as striated or microscopically structureless are distinguished by this technique without the need for any special preparation of the fiber. A sample is mounted in a liquid of high dispersion which has a refractive index near that of the fiber and the fiber is identified by the resulting coloration, using an ordinary compound microscope set-up for dark-field illumination.

Diagonal Sectioning Techniques for Studying Fabrics

M. R. Pesce and A. S. Wrigley, Textile Research Journal, page 646, Vol. XIX, No. 10, October, 1949.

By using a diagonal sectioning technique, it is possible to obtain, with only one section, an uninterrupted sequence of views through and between alternate yarns. Diagonal sections can be prepared by embedding the fabric in pasticized methyl metacrylate monomer, mounting the polymerized resin block in a biological microtome, and orientating the specimen holder so that the fabric is sliced in a plane tilted at a small angle to the plant normal to the warp (or filling) direction. A number of illustrations are given.

Cellulose Studies

XII. The Degree of Polymolecularity of Acid-Modified Celluloses

P. C. Mehta and Eugene Pacsu, Textile Research Journal, page 699, Vol. XIX, No. 11, November, 1949.

For the determination of the degree of polymolecularity in acid-modified celluloses, the nitrates of hydrocelluloses from native cotton, surgical cotton, and viscose rayon were fractionated from dilute acetone solutions. The results indicate that a large proportion of the hydrocelluloses are uniform in that almost 33% of the methanolyzed native cotton consists of molecules with D.P. 252, about 70% of the hydrocellulose from surgical cotton has D.P. 260, and some 36% of the material from viscose rayon possesses D.P. 62. Moreover, the most important fractions were found to be integral multiples of the assumed "limit hydrocellulose" with D.P. 64. Integral- and mass-distribution curves were constructed from the experimental data according to the procedure outlined by Schulz and were compared with the theoretical mass-distribution curves calculated on the basic assumption of random hydrolysis of a long-chain molecule with uniform hydrolyzable bonds. In all three cases the experimental curves show pronounced peaks, which can be readily interpreted only on the basis of the new concept of cellulose structure.

Luster and Cotton

George S. Buck, Jr. and Frank A. McCord, Textile Research Journal, page 715, Vol. XIX, No. 11, November, 1949.

The first part of this paper deals with market prospects. Part II reviews the technical aspects of textile luster and an attempt has been made to include the essence of available factual material on the subject and at the same time to condense and simplify the entire discussion as much as possible. The following items are discussed: nature and origin of textile luster, fabric design and construction, luster finishes, and luster measurement in textiles and topics for research. The following approaches were suggested for research: selection and breeding, influence of non-cellulosic impurities, surface character of the cotton fiber, crystalline orientation, swelling and shape improvement, fiber-surface polish, fabric construction and design, control of fuzzing, use of fluorescent materials, improved mercerizing, improved cuprammonium finishes and importance of reflected and refracted light components.

X-Ray Microradiography of Fibers and Fabrics

Charles H. Lindsley, Earl K. Fischer, and Joseph H. Brant, Textile Research Journal, page 686, Vol. XIX, No. 11, November, 1949.

Soft x-rays or Grenz rays can be used to form shadowgrams of single textile fibers as well as of yarns and fabrics on fine-grain photographic plates. This paper deals primarily with the microradiography of single fibers and includes a description of experimental equipment, conditions under which necessary resolution is obtained, impregnation of fibers with substances to increase absorption of x-radiation, and examples of the utility of the method. Single cotton, rayon, wool, and other fibers are clearly resolved by x-radiation generated at 5 kv.; at higher voltages (to 17 kv.), natural fibers give faint shadowgrams. When the fibers are impregnated with 10-20% lead sulfide or other materials, single treated fibers can then be distinguished in masses of untreated fibers. The technique provides a possible means for tracing individual fibers through processing operations.

The Fine Histology of the Keratin Fibers

Joel Lindberg, E. H. Mercer, Bo Philip and Nils Gralen, Textile Research Journal, page 673, Vol. XIX, No. 11, November, 1949.

An account is given of the fine histology of wool fibers and hairs as revealed by recent optical and electron microscopy. Explanations of several fiber relations in terms of the complex structure of the cuticle are suggested. The need for a definite terminology for the new components is emphasized and the following suggestions, based on the usage in connection with other cuticles, made: the *epicuticle, exocuticle,* and *endocuticle* for the components previously included in the term "cuticle"; and *fibrils, microfibrils,* and *cortical cement* for the components of the cortex.

The "Subcutis" and Other Cuticular Preparations from Wool and Hair

E. H. Mercer, Joel Lindberg and Bo Philip, Textile Research Journal, page 678, Vol. XIX, No. 11, November, 1949.

Three components may be recognized in the cuticle of wool and hair: endocuticle, exocuticle, and epicuticle. The epicuticle, although exceedingly thin (100 Å.), is very resistant chemically; the intermediate layer, although protein in character, also differs considerably from the keratin of the cortex and the endocuticle. It is therefore possible, by dissolving the keratin, to separate the epicuticle, thickened by the adhesion of more or less of the intermediate layer, in the form of a continuous tube, the external surface of which is that of the original fiber.

A method of preparing such tubes by heating fibers in formalin was described by Lehmann, but the material was thought to originate beneath the cuticle and was named the "subcutis." Histologically, similar tubes result from the tryptic digestion of supercontracted fibers and the peptic digestion of reduced and ethylated wool, as described by Geiger.

The Reactivity of the Sulfur Linkage in Animal Fibers

VI—The Cause of Unshrinkability

A. J. Farnsworth, W. J. P. Neish and J. B. Speakman, Journal of the Society of Dyers and Colourists, page 447, Vol. 65, No. 9, September, 1949.

In order to test the view that reagents such as chlorine, sulfuryl chloride, and sodium hydroxide make wool unshrinkable by promoting disulfide bond breakdown in the surface of the fibers, the action of these reagents on wools containing other types of cross-linkages in place of cystine has been examined. Four kinds of wool have been used, viz: (1) wool reduced with thioglycollic acid and treated with mercuric cyanide to form —S.Hg.S— cross-linkages, (2) wool reduced with thioglycollic acid and treated with trimethylene dibromide to form bisthioether cross-linkages, (3) alkali-treated wool containing lanthionine and, presumably, —CH:N— cross-linkages, and (4) wool treated with potassium cyanide to convert most or all of the cystine into lanthionine. In all cases, the modified wool was more difficult to make unshrinkable than untreated wool, though the difference was small with types (1) and (2). Very successful results were obtained with the alkali-treated wool (3), and complete immunity to the action of chlorine, sulfuryl chloride, and potassium hydroxide, as regards the development of resistance to shrinkage, was obtained with wool treated with potassium cyanide (4). Since the action of potassium cyanide is to convert disulfide bonds into lanthionine cross-linkages, there can be little doubt, therefore, that the above reagents make normal wool unshrinkable by causing disulfide bond breakdown.

Recent Developments in Synthetic Fibers

A. S. Carpenter, The Journal of the Society of Dyers and Colourists, page 469, Vol. 65, No. 10, October, 1949.

The newer synthetic fibers are discussed according to the following groupings: Condensation Polymers—Terylene and polyurethanes; Addition Polymers—Vinyon N, Orlon, vinylidene copolymers, polyethylene and polystyrene; Modified Naturally-Occurring Substances of High Molecular Weight—protein fibers and fibers from rubber; General Considerations—crystallinity, molecular orientation and molecular architecture.

Studies in the Fundamental Processes of Textile Printing

I—The Transfer of Dye from Thickener to Fiber Substance During Steaming

R. H. Munshi and H. A. Turner, Journal of the Society of Dyers and Colourists, page 434, Vol. 65, No. 9, September, 1949.

The complexity of the normal printing process on cellulosic fabrics has been reduced in order that the characteristics of dye transfer from the applied printing paste to the cellulose might be studied quantitatively under standard conditions. The behavior of a number of purified direct cotton dyes has been studied. In many respects the transfer properties of the dye are similar to those which are observed when the dye is applied from aqueous solution by a dyeing process, but important differences are found, especially in the proportion of dye transferred from the external phase to the cellulose.

Some Recent Observations on the Theory of the Dyeing of Wool with Chrome Dyes

J. F. Gaunt, The Journal of the Society of Dyers and Colourists, page 429, Vol. 65, No. 9, September, 1949.

This paper gives the present position of the theory of dyeing with chrome dyes according to the following scheme: (a) combination of wool and chrome, (b) combination of wool and dye, and (c) combination of chrome and dye. In summarizing the paper it is pointed out that there are still a large number of gaps in the present theory and further work on these would be of considerable practical importance in the application of chrome dyes.

The Dyeing of Textiles

F. W. Thomas, The Journal of the Society of Dyers and Colourists, page 479, Vol. 65, No. 10, October, 1949.

This paper gives a general picture of the trends in textile drying in England and other countries and compares the relative efficiencies of the various methods from the standpoint of energy utilization.

The Application of Chemistry to Textile Finishing

E. Wilson, Journal of the Society of Dyers and Colourists, page 497, Vol. 65, No. 11, November, 1949.

This is the Sixth John Mercer Lecture and deals with the contribution of the chemist to finishing. It is discussed according to the following classification: *Enhancement*—filling, organdie finishes, luster, crease-resisting; *Proofing*—shower-proofing, mildewproofing, mothproofing, flameproofing; *Serviceability*—dimensional stability, improved fastness to storage, resistance against fiber slippage, improved fastness to washing, improved wearing quality. The author believes that the trend toward carrying out chemical reactions on the fiber will continue and that the search for new effects by this method will intensify. He further predicts an ever increasing flow of synthetic fibers which will demand a higher degree of chemical skill in the finisher.

The Relationship Between the Chemical Constitution of Vat Dyes and their Dyeing and Fastness Behavior

M. R. Fox, Journal of the Society of Dyers and Colourists, page 508, Vol. 65, No. 11, November, 1949.

An outline is given of the developments in vat dyeing technique over the past twenty-five years and an attempt is made to correlate the effects of the chemical constitution of vat dyes on dyeing and fastness properties. Present conceptions of the mechanism of vat dyeing are described and 119 vat dyes (mainly anthraquinonoid) are arranged in five chemical classes, which are further sub-divided into groups of closely similar constitution and properties. The hue characteristics and dyeing and fastness properties of each group are then described. The dyeing properties of vat dyes (with particular reference to a series of unsubstituted anthraquinone-carbazole dyes) are then reviewed and some general rules are found to exist in respect of dyebath assistant requirements (caustic soda, sodium hydrosulfite, and exhausting salt) as well as for migration powers. Leuco stability of the vat in respect of over-reduction, hydrolysis, dehalogenation, and molecular rearrangement has been investigated from the point of view of the constitution of the individual dyes. Fastness properties and their relation to the constitution of the dyes have been examined from the viewpoint of resistance to light, overoxidation, bleaching, washing, and soda boiling. Finally, a simple test for the determination of the tendering powers of vat dyes on cellulose on exposure to light is proposed. A large number of dyes have been examined by a silver staining technique, and tendering has been directly related to the constitution of many dyes. Attempts to prepare inactive yellow and orange dyes by mixing active and inactive dyes proved of little value, but in the production of greens it has been found possible to inhibit tendering, even in the presence of a highly active yellow.

Difficulties in Screen Printing

"A Technical Correspondent", Canadian Textile Journal, page 41, Vol. LXVI, No. 20, September 30, 1949.

Among the items discussed in this article are the following: the printing foundation, water-soluble adhesives, washing the tables, discharge printing faults, steaming of discharged prints, pin marks and sparking, faults in printing technique, unevenness of shade and print paste faults.

Disposal of Dyehouse Wastes

Canadian Textile Journal, page 44, Vol. LXVI, No. 20, September 30, 1949.

Data is presented on the waste-disposal procedure now used at the Chester Lace Mills, Chester, Pa.

• PATENT DIGEST •

PAUL WENGRAF

Cloth Feeding Device—Automatic Control C, 6

U. S. P. 2,482,497

(United Merchants & Manufacturers, Inc., Miller, Sept. 20, 1949).

In processing fabrics in rope form, it is essential to avoid tensions between pairs of driven feeding rollers. That may happen in continuous dyeing and bleaching operations. The principle in carrying out this procedure is in that the pair of rollers at the entrance must not deliver substantially more or less of the material than can be withdrawn by the rollers on the outlet. A simple device has been proposed in the present patent to regulate the speed of the traveling goods. The fabric which comes in rope form from a washer or the like (see Fig. 1) enters first by means of belt-driven rollers (2-3) and over (5) the J-box (10) which normally is in the position marked by full lines. As long as delivering and withdrawal by the (likewise belt-driven) roller (8) proceed at about the same speed, no goods will be accumulated in the J-box. However, if normal running is interrupted by one reason or the other and more cloth is withdrawn and delivered to bin (9), the increased weight on the left-hand side of the J-box (10) which is mounted on a horizontal axis (12) causes sliding of box (1) into the position shown by the dotted lines. In this event, a switch (16) is activated, stopping a motor (7) and, thereby, the movement of roller (8) until enough material is delivered again to the right-hand part of J-box (10). This returns to the first position, closing the switch and causing the motor (7) to work again. A modification of this device is shown in Fig. 2. Here a rheostat-type motor controller (19) is substituted for switch (16). This arrangement has

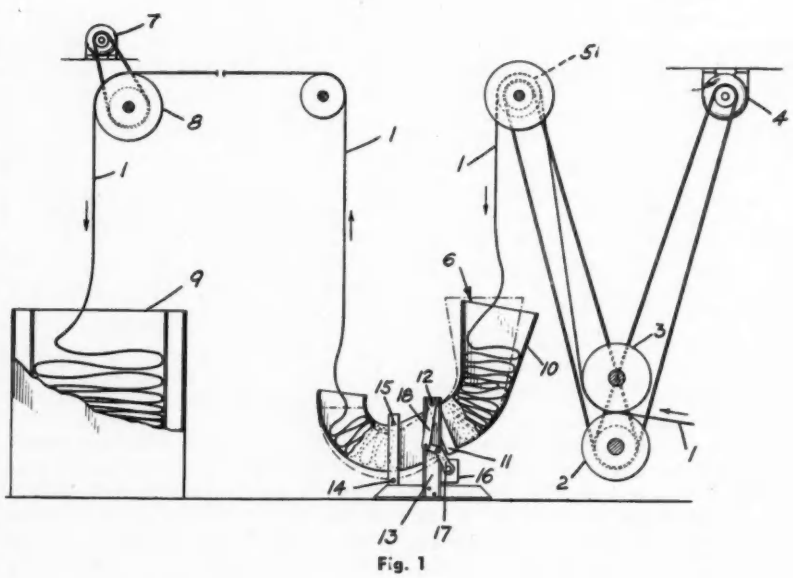


Fig. 1

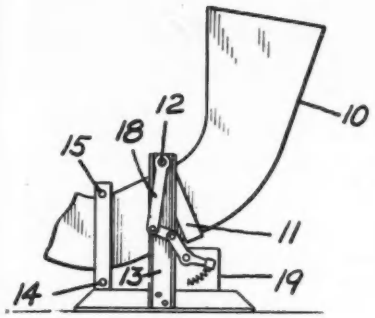


Fig. 2

the advantage of avoiding too frequent and sudden stopping and starting of the motor. Instead, it effects a smooth retarding or accelerating movement of the roller (8).

References cited by the Patent Office, among others:

U. S. Pat. 2,317,921, 1947 (Filatex Corp.)—a process and device for handling elastic material, especially rubber threads, which feeds the goods into a zone where they are permitted to contract freely to a point of zero tension while the material is free from any tension or weight other than its own.

U. S. Pat. 2,193,189 (Morgan, Brooke) —a control means for continuous strip steel rolling mills when sagging of the strip is abnormal, the change of speed between adjacent pairs of rolls is effected by a movement of elements of an electro magnetic device.

Wear Resistance of Wool Felt—Increased Treatment with Organic Isocyanates

A, 2, 02

U. S. Pat. 2,482,578
(Arthur D. Little, Doggett, Johnson, Sept. 20, 1949)

Treatment with organic isocyanates has been described for waterproofing cellulosic and other textiles. The present invention, dealing especially with a wool felt treatment, has the inverse purpose. The material has to be used principally as paper mill felt and, therefore, water repellency has to be avoided since easy penetration is desirable to readily adsorb the water contained in the paper mass. Moreover, it is an object of this process to increase the life time of the expensive material. It has been observed that small amounts of organic isocyanates (about 0.1% from the weight of the goods) render wool fabrics water repellent to some extent, but *increased quantities* of 3% to 25% (preferably between 4-8%) do not further interfere with the wettability of wool, i.e., water is readily adsorbed under this condition. According to several examples, octadecyl isocyanate $C_{18}H_{37}$—N:C:O is applied in organic solutions (benzene), in emulsion, etc. after which the excess is removed and the material baked at a temperature of 110°C. The wear resistance was tested as superior to that of the non treated fabric while no substantial loss of wettability could be found. The inventors assume that this increase in wear resistance is effected by a decrease of the fiber-to-fiber abrasion, e.g., by an efficient lubricating action. Since the organic isocyanates fixed within the wool fiber can no longer be removed by boiling solvents nor by water and soap, it is concluded that a chemical reaction takes place between reactive hydrogen atoms on the wool surface according to the schematic equation: Wool-H + O:C:N:$C_{18}H_{37}$ ⟶ Wool -CO-NH-$C_{18}H_{37}$. This invention is supposed to be of some interest for processing woolen clothing or socks because it does not interfere with adsorption or release of moisture in vapor form.

Stabilizing Cellulosic Textiles—(Shrinkproofing)—Glyoxal Plus Salts of Oxydizing Acids

G, 2, 04

U. S. Pat. 2,484,545
(Alrose Chemical Company, Beer, Oct. 11, 1949)

This specification refers to previous methods for reducing shrinkage of cellulosic textiles, i.e., natural and synthetic fibrous material in any stage of processing (raw stock, skein, woven or knitted fabrics). Generally, formaldehyde or formaldehyde yielding agents have been applied. These methods are criticized as dangerous because of the tendering effect on cellulose, free acids usually being present. The same is said to be true in the event of finishing cellulosic material with glyoxal plus oxalic acid as a catalyst (see U. S. P. 2,412,832 below). A loss of tensile strength of 10-20% was frequent. The present process comprises a treatment with glyoxal in the presence of *alkali salts* of oxydizing acids such as nitric, chloric or perchloric acids. The drying and curing operations are carried out either in two steps or in one single step and followed by soaping, rinsing and drying as usual. The characteristic feature is that phenolic or amidic resin forming compounds as well as *free oxydizing acids* are avoided since the acids are fixed by alkalis. By the same reason, application of persulfuric acid, splitting off free sulfuric acid in the heat, is excluded. Cation active softeners may be added to the impregnating bath if desired. It is claimed that the effect obtained in this process is durable, even after repeated washing at the boil. According to one of the examples, a viscose fabric is padded in a 4% solution of commercial glyoxal (approximate concentration 30%), containing 0.5% potassium chlorate. The pick-up is 100%; the fabrics are dried at 80°C. and cured for 5 min. at 130°C. Generally, drying and curing can be effected in a single step when the appropriate equipment is available. A table gives comparative figures on shrinkage, tensile strength and abrasion resistance. It especially has to be noted that the shrinkage of the raw untreated goods amounts to 9.7-10.8% in four consecutive washings while the treated material shows practically no shrinkage at all.

Reference cited by the Patent Office, among others:

U. S. Pat 2,412,832, 1947 (Cluett Peabody): recommendation of a glyoxal treatment for shrinkproofing (see *Reporter* 1947, 332). Neither alkali-chlorites, perchlorates nor nitrates are mentioned here.

Other reference: Stabilizing treatment of cellulosic textiles with glyoxal, first mentioned in U. S. Pat. 1,857,263 (I.G.) of 1932. It is supposed that glyoxal reacts with the OH-groups of cellulose. Breaking strength and elongation are claimed to be improved.

Creaseproofing Textiles—Water-Soluble Precondensates, Followed by Acid Steam

G, 2, 04

U. S. Pat. 2,484,598
(Alrose Chemical Company, Weisberg, Stevenson, Beer, Oct. 11, 1949)

The conventional method of creaseproofing textiles, first described in the Tootal-Broadhurst patents, was based on the use of formaldehyde precondensates applied in the presence of acid catalysts and followed by a curing operation. The present specification states that this and analogous methods have many drawbacks, especially the substantial loss of tensile strength amounting to 30-50% and the reduction of resistance to abrasion. This disadvantage is particularly noticeable in cotton goods treatment. The application of salts of volatile bases and fixed acids which only gradually develop acid agents during the heat treatment, is likewise termed as unsatisfactory. The invention consists of impregnating with a water soluble or water dispersible precondensate of the formaldehyde-urea or Formaldehyde-melamine type, drying at moderate temperatures and curing in a steam atmosphere at 212-250°F. (preferably at 212-220°F.) in the presence of steam volatile organic (formic, acetic, propionic, etc.) acids. These are introduced into the steamer in the form of acid vapors such as those used in developing Rapidogen colors. Results obtained by working with solutions with or without the addition of a potential acid salt

are compared (e.g., ammonium sulfate, liberating sulfuric acid in the steaming procedure). The tensile strength of the sample treated according to the present method remained unaltered, though it was substantially reduced in warp and filling with the addition of ammonium sulfate. The amount of pre-condensates is limited here with 100-300 g. per liter, calculated on a 100% pick-up of the dry goods in the impregnating step.

References cited by the Patent Office, among others:

U. S. Pat. 2,088,227 (Tootal, Broadhurst); impregnation with a slightly condensed resinous product and a potentially acid substance (for instance, ammonium diphosphate) for increasing creaseproofness.

U. S. Pat. 2,191,362 (Ciba): melamine-formaldehyde impregnation in a neutral medium followed by a heat treatment up to 100°C.

Brit. P. 437,462, 1935 (Calico Printer's Ass'n.): a reversed process for producing resin condensates on the fiber. It consists of impregnating with mixtures of amines (or soluble precondensates) plus organic acids, followed by formaldehyde-steam treatment.

Further reference is made to the same inventor's U. S. Pat. 2,441,859 (see *Reporter* 1948, 768) describing a treatment with neutralized aldehydes, followed by acid steaming; the process is particularly intended for shrink-proofing textiles.

Shrinkproofing Wool—Water Soluble Precondensates, Followed by Acid Steam A, 2, 04

U. S. Pat. 2,484,599

(Alrose Chemical Company, Weisberg, Stevenson, Beer, Oct. 11, 1949)

The shrinkproofing process protected by this patent is principally analogous to the method described in the same inventor's U. S. Pat. 2,484,598. While shrinkproofing wool with formaldehyde condensates has frequently been proposed, this treatment proved to attack on fibers in the subsequent baking procedure when the temperature was too high or the duration of the treatment was too long. On the other hand "underbaking", an incomplete development of the condensates, is a drawback which cannot be overlooked. In impregnating fabrics with neutral water soluble pre-condensates and passing it through an acid-saturated steam the fiber strength is not impaired even in a prolongated treatment. The relatively low curing temperature preserves the hand of the goods while the known disadvantages occurring in exposing wool material to dry heat (such as hard touch, yellowing, loss of elasticity) obviously are avoided as much as possible. According to tables inserted in the specification, the shrinkage of goods treated by this method was 4.4-5.0% after five washings. Non-treated wool shrunk up to 15%.

References cited by the Patent Office:

Re-Issue 22566, 1944 (to U. S. Pat. 2,329,622) (American Cyanamid).—Aqueous methylated methylolmelamine solutions are used for impregnating textiles without adding catalysts. Curing is effected by elevated temperatures only.

U. S. Pat. 2,088,227 and 2,191,362 (see foregoing digest).

U. S. Pat. 2,235,141, 1941 (Celanese): increasing the resiliency of textiles, especially acetate of cellulose, by impregnating with neutral formaldehyde condensates and aftertreating with acid gases (preferably HCl). The resin formation is effected at 50-70°C.

Water Repellent Fabrics—Alkylsilicon-Thiocyanates Used G, 2, 02

U. S. Pat. 2,485,603

(Du Pont, R. M. Joyce, Jr., Oct. 25, 1949).

Organosilicon chlorides have often been recommended for rendering textile water repellent. These silicon chlorides undergo hydrolysis with liberating hydrochloric acid, which attacks cellulosic fibers. As a new class of compounds the corresponding organosilicon thiocyanates have been synthesized; these have no tendering effect at all on cellulose. Alkyl silicon thiocyanates are prepared by reacting, in an organic solution, an alkyl (also alkenyl, aryl, aralkyl, etc.) silicon chloride with an inorganic thiocyanate, e.g.—$Pb(CSN)_2$. The final product obtained (e.g., by reacting dimethyl silicon chloride with lead thiocyanate) has the formula $(CH_3)_2$ Si $(CSN)_2$; it is dissolved in dry benzene, methylketone, etc., dried and heated for 5 minutes to 125°C. No tendering of the fibers could be noticed and the water repellency was very good and stable. Another example cites a water-repellent agent prepared from phenyl silicon trichloride and lead thiocyanate.

References cited by the Patent Office, among others:

U. S. Pat. 2,405,988, 1946 (Dow Chemical): silicon compounds, substituted with higher aliphatic chains, are found to have a superior water repellent effect than analogous products substituted with lower hydrocarbon chains.

U. S. Pat. 2,404,426, 1946 (Du Pont): wear resistance of organic polymers is increased by coating with acid polysilicic esters of an alcohol from 1-12°C.

U. S. Pat. 2,390,370, 1945 (Corning Glass Works): Glass fibers are coated with silicium derivatives (e.g.—phenyl ethyl polysiloxane, 1-methyl-polysiloxane or the like).

U. S. Pat. 2,253,128, 1941 (Du Pont): silicon-tin-tetrachloride or similar compounds of this class reacted with methacrylic acid salts. Si-tetramethacrylate is obtained which can be used as impregnating agent for producing permanent finishes.

U. S. Pat. 2,238,669, 1941 (Du Pont): a process for preparing silicon-organic compounds where all four valences of the Si atom are bound to hydrocarbon radicles (e.g.—tetraphenyl silane, obtained by reacting silicium tetrafluoride with chlorobenzene in the presence of alkali metal).

Further reference is made to U. S. Pat. 2,415,017, 1947 of Montclair Research Corporation regarding water repellent finishes with silicon containing fatty amides which have first been treated with paraformaldehyde to obtain the methylol compounds. See REPORTER, 1947, 396.

Shrinkproofing Wool—Butadiene or Derivatives, Copolymerzed with Acrylonitrile A, 2, 04

U. S. P. 2,484,962

(Montclair Research Corp., Rust, Oct. 18, 1949).

Various suggestions for shrinkproofing wool by using polymerizable compounds have been published in recent times, e.g. —methacrylate resins, butadiene copolymers and so on. The inventor states that these resins are not equally suitable for obtaining a shrinkproofing effect. It has been observed that the best shrinkproofing results can be expected by applying copolymers of butadiene—1-3 and acrylonitrile. Instead of butadiene, derivatives thereof (i.e.—1-3-isoprene, dimethylbutadiene, ethylbutadiene and other substitutes) may be used. Acrylonitrile may further be replaced by lower alkyl derivatives such as methacrylonitrile or butacrylonitrile. These copolymers can easily be prepared at high speed. The polymerization is best carried out in emulsion in the presence of a catalyst (preferably a peroxide) by heating the components and working under pressure. The pH of the solution should be kept at a constant value during this operation, the limits being between 4 and 11 and preferably 7-11 according to the nature of the emulsifying agents (this value being carefully adjusted by buffering substances). Soap as well as synthetic organic auxiliaries is used as an emulsifier. The interpolymers are finally obtained in latex form. The shrinkproofing effect is improved more by an oxidizing treatment (for instance, by subjecting the emulsion to 70-100°C. in the presence of

oxydizing agents). This second operation is termed as "oxidative prevulcanization", intended to remove the original tackiness of the impregnated textiles. 1-25% of resin solid calculated from the wool's weight are applied. An example cites the preparation of butadiene-acrylonitrile polymers, the butadiene being present at a considerably greater percentage than the nitrile, by introducing the components into the reaction vessel at 5°C., adding a buffer solution of pH 11, sodium laurylsulfate (as an emulsifier) and ammonium persulfate (as a catalyst). The reaction was effected within 6-7 hours at 45°C. A sample of wool was wetted, immersed in this emulsion, and heated to 60°C, while salt was gradually added. The untreated swatches shrunk 30%, the treated ones only 6% on the average.

References cited by the Patent Office, among others:

U. S. Pat. 2,366,313, 1945 (Goodrich): polymerizing 1-3 butadiene in presence of dialkyl polysulfides.

U. S. Pat. 2,386,447, 1945 (Dow Chemical): the use of rubber-like copolymers of conjugated diolefins and unsaturated ketones.

U. S. Pat. 2,329,622, 1943 (American Cyanamid): shrinkproofing wool with alkylated methylolmelamine.

U. S. Pat. 2,235,149, 1941 (U. S. Rubber): preparation of a rubber-like material by applying a conjugated 1-3-diene copolymerized with an unsaturated nitrile.

Reference is further made to the digest of U. S. P. 2,447,538, 1948 (same company and same inventor) in REPORTER 1949, 204.

Stabilizing Cellulosic Textiles, Ketone-Aldehyde-Starch Condensates Used G, 2, 04

U. S. Pat. 2,486,399
(Dan River Mills, Gagarine, Nov. 1, 1949)

This patent protects a textile treatment with polymeric polyhydric alcohols condensed with ketones and aldehydes. The term "polyhydric alcohols" is intended to cover especially (but not exclusively) starch products such as dextrines, polyvinyl alcohol or hydroxy ethyl cellulose. By reacting starch with formaldehyde in the presence of an alkaline catalyst, methylol starch is obtained which, in turn, condenses with methylol acetone, a reaction product of acetone with formaldehyde. The final product is the starch-formaldehyde-acetone copolymer applied to fabrics. It has further been observed that this co-polymer reacts with cellulose fabrics to form cellulose ethers under the influence of heat. These are said to impart valuable properties to the textile material. Besides an increase of shrinkage resistance, creaseproofing and durable finishing effects, mildew resistance and good tensile strength have been observed. The effects may vary according to the proportion of the components (i.e., methylol starch and acetone methylol). The most favorable ratio is 3 p. acetone methylol to one p. methylol starch. The amount of the latter component, however, should not be more than 3 p. when a maximum shrink resistance is desired. By increasing the amount of starch methylol (for instance, by using 1 p. or more to 1½ p. acetonemethylol) some nonreacted methylol starch is left in the composition. The result can be described as a less shrink resistant, but heavier, finish. The proportions of formaldehyde to acetone in forming acetone methylol are likewise important for the final effect. 5-6 mols formaldehyde to one mol acetone will give best shrinkage control while 2-4 mols of formaldehyde to one mol acetone gives better crease and mildew resistance of the fabric treated with these finishes. An example cites the preparation of a starch-formaldehyde mixture (which does not react spontaneously), stirring with a dilute solution of soda ash and caustic at room temperature until reaction takes place, running the mixture into another tank where acetone and formaldehyde have been well mixed, and letting the exothermic reaction proceed while the initial pH value of 12 drops to 7 within 40 hours. When the condensation is complete, a viscous, water soluble product is obtained which is useful for impregnating a cellulose fabric. The goods are dried on a tenter frame heated to 305°F. It is to be noted that in this phase a (partial) transformation of the cellulose substance into insoluble cellulose ethers occurs. This reaction is responsible for the improved properties of the fabric. One of the most interesting features is that no chlorine is retained in a laundry aftertreatment in contrast to customary formaldehyde-resin finishes.

References cited by the Patent Office, among others:

U. S. Pat. 2,411,818, 1946 (Heberlein): shrink resistant finishes, using 2-10% formaldehyde, a catalyst and a formaldehyde reacting colloid such as gelatine, gum, starch, etc.

U. S. Pat. 2,309,481, 1945 (Chemical Laboratories): formaldehyde-acetone resins applied in connection with a natural gum (arabic or tragacanth).

U. S. Pat. 2,288, 695, 1942 (Bell Telephone): cellulose material prepared with urea-formaldehyde resins to increase insolating properties.

U. S. Pat. 2,159,875, 1939 (Cilander): sizing cellulosic filaments with acetone-formaldehyde condensates.

Brit. P. 551,693, 1943 (Calico Printers): fixing dyestuffs which otherwise have no affinity for cellulose, with ketone-aldehyde condensates.

For information regarding the reaction of starch with formaldehyde compounds see also U. S. Pat. 2,417,555 (REPORTER 1947, 418.)

Pigment Dyeing, Alginates Added to Oil-In-Water Dispersions C, 4, 07

U. S. Pat. 2, 488,544
(Sherwin Williams Co., Kuhn, Bodenschatz, Nov. 22, 1949)

Pad dyeing with emulsified water insoluble pigments was first described by Jennings in his U. S. Pat. 2,334,199. This process is characterized in the present specification as sometimes giving uneven results. This is probably due to non-uniform penetration of the dyebath by the reason of the threads contained in the fabric being more tightly spun than others. The main feature of this patent can be seen in the use of water soluble alginates (sodium or ammonium alginates preferred). It has been observed that the dyeing results become more uniform in this event. It is assumed that the alginate salt causes flocculation of the dispersion. A presscake of Monastral Blue (a phthalocyanine pigment) is flushed with water and mixed with a solvent soluble melamine-formaldehyde resin ("Melmac 245--8"), a petroleum hydrocarbon ("Sovasol 5 A"), and a solvent soluble ethyl cellulose (Ethocel). It is then roller milled until the paste has a smooth consistency. This paste is ready for shipping and can be emulsified on the point where it has to be used with water to which one of the known emulsifiers (Igepal CA, Triton X-120 etc.) is added. According to this invention, a oil-in-water emulsion, prepared as described above and adjusted with water to the necessary concentration, is mixed with a 0.2% solution of sodium alginate, known in the trade as "Kelgin". This should be, preferably, in a concentration of 0.1% by weight of the water-content of the impregnating liquid.

References cited by the Patent Office, among others:

U. S. Pat. 2,364,692 (Interchemical Corporation): multiple phase emulsions containing an aqueous phase, a concentrated pigment resin solvent phase and a lacquer of low solid content.

U. S. Pat. 2,356,794, 1944 (American Cyanamid): an oil-in-water type printing paste, consisting of a solvent soluble modified alkyd resin + urea-formaldehyde + insoluble alkyl cellulose dispersed in water.

U. S. Pat. 2,338,252, 1944 (Interchemical Corporation): a pigment, dispersed in a mixture of polyvinyl alcohol + urea-formaldehyde. This mixture will gel in storage, adding a nitrogenous volatile base which inhibits gelation.

U. S. Pat. 2,275,991, 1942 (Rohm & Haas): textile printing paste, containing an alkyl cellulose polyacrylate, locust bean or tragacanth thickener, a water insoluble dyestuff pigment and a water insoluble resin.

For references, regarding various effects of alginates see digests of U. S. Pat. 2,426,125 (REPORTER 1947, 720) and U. S. Pat. 2,430,180 (REPORTER 1947, 290). According to U. S. Pat. 2,477,912 (Kelco), alginates added to starch sizes prevent penetration, especially for the use as adhesives.

Dyeing Apparatus, Continuous Treatment of Fabrics Rolled in Double Ply C, 6

U. S. Pat. 2,481,992
(Earl J. Fisher, Sept. 13, 1949)

Although the present invention can be applied to any continuous process in treating fabrics or paper sheets (e.g.—bleaching, finishing, etc.) it seems to be principally intended for pigment dyeing purposes; therefore, it should be discussed in group C, 6. The characteristic feature of the apparatus is the sheet material rolled in two plys on one shell, permitting the attachment of the end of the fabric to the foremost end of another fabric without stopping the machine. According to Fig. 1, a roll (11) is rotatably mounted on a frame (10) and processed through a dyeing unit (12) to a dryer, a steam chamber or the like (15). It then passes a compensating device, illustrated in detail in Fig. 5, and is finally wound up on shell (21). Preparation of the double sheet rolls to be placed in frame (10) is essential. The fabric coming from a roller (40)—see Fig. 2—is first rolled on (36) to a length of about 100 yards, thereupon (36)—see Fig. 3—is raised and the fabric is now wound on (37) while a portion of the fabric on (36) is cut off and also wound on (37). The roll on (37) consists finally of two plys; it is placed on frame (10) and one end of the plied sheet passes around rollers (13), through the padding vat (12) and developing unit (15). [the number (12) has been omitted in Fig. 4 but shown in Fig. 1], and over the compensatory device to be rolled up on (21). The other sheet, formerly rolled on (36), drops in the container (47). The other end can be sewn or otherwise connected at (50) with end (51) of the fabric (37) so that any interruption of the treatment caused by the stopping of the machine is avoided. An analogous procedure takes place at the taking-off end between shells (63) and (21 a)—see Fig. 5 and 6—for preparing double rolls again. The compensatory device comprises a weight (78 a) attached by two cables (72) to the compensating bar (70), raising the fabric automatically with slackening tension until the winding operation onto another shell is completed.

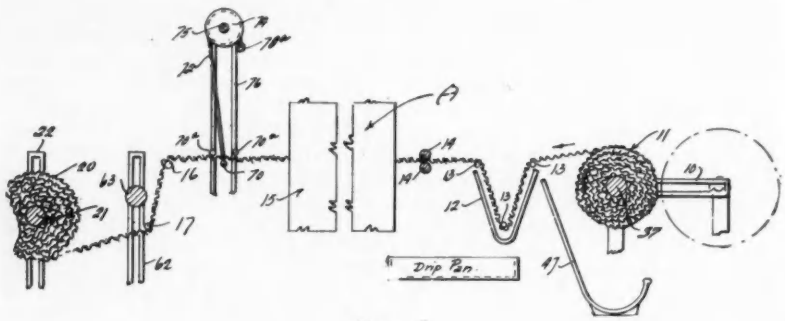


Figure 1

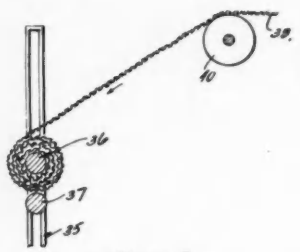


Figure 2

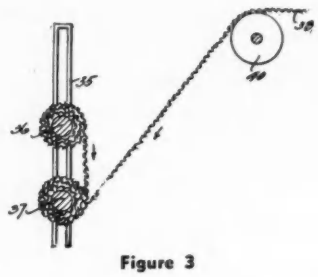


Figure 3

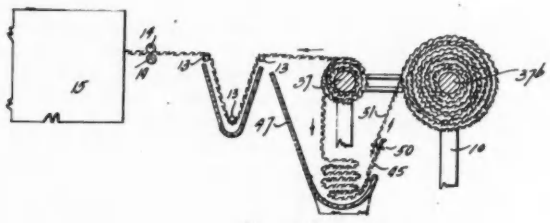


Figure 4

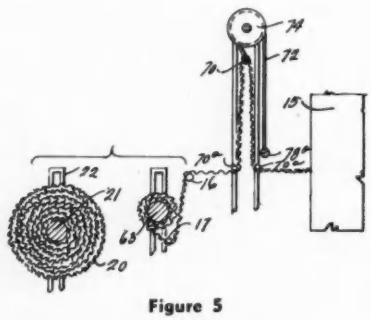


Figure 5

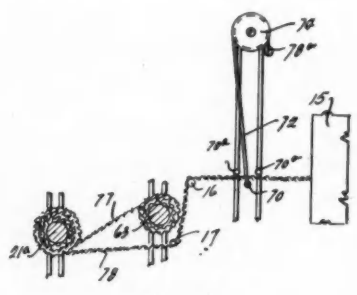


Figure 6

References cited by the Patent Office, among others:

U. S. Pat. 2,357,389, 1944 (Crucible Steel Company): protection for an apparatus for feeding and coiling continuously cold metal strip material, comprising a special compensatory device for maintaining the strip under permanent tension.

U. S. Pat. 2,195,008, 1940 (Westinghouse Electric & Manufacturing Co.): a device containing a coiling reel which winds up metallic strips in such a way as to leave both ends of the strip accessible. It functions as an accumulating device while one end of the strip remains stationary.

U. S. Pat. 2,062,008, 1936 (Firestone Tire and Rubber Co.): a compensating apparatus especially for impregnating weak-wefted cord fabrics for tire casing, characterized by its maintenance of fabrics in uniform tension until the rubber emulsion is completely dry.

TRADE NOTES • NEW PRODUCTS

George L. Armour

• George L. Armour Elected President of American Aniline Products, Inc.

At a regularly scheduled meeting of its Board of Directors, it was announced that George L. Armour was elected to the Presidency of American Aniline Products, Inc., 50 Union Square, New York City.

Mr. Armour, Executive Vice-President since the inception of the company in 1917 succeeds his late brother, Bernard R. Armour. He had previously been in complete control of the operations of American Aniline for years and has been a Director since 1917.

Mr. Armour is also President and a Director of both American Aniline Products, Inc. (Illinois subsidiary) and Dominion Anilines & Chemicals, Ltd. of Toronto and a Director of Ansbacher-Siegel Corporation, pigment manufacturers, of Rosebank, Staten Island, New York.

It was also announced that William O. Henley, Comptroller since 1934 and recently elected a Director, has assumed the duties of Treasurer.

William O. Henley

Cowles Chemical Company Research Laboratory

• New Cowles Research Lab

Cowles Chemical Company, Cleveland, Ohio has moved its research and development laboratory from the campus of Syracuse University to enlarged quarters at 105 South Townsend Street in downtown Syracuse, New York, according to announcement recently made by C. W. MacMullen, Technical Director of the Company. The new laboratory is of fireproof construction having a reinforced concrete floor, brick walls, and sheetrock ceiling. It is located on the second floor of the building.

Research projects at Syracuse include development of heavy chemicals in the silicate field, laundry products, metal cleaners, detergents and bactericides for the food processing industries, organic research and the engineering of new processes and equipment for the company's three plants located at Lockport and Skaneateles Falls, New York and at Sewaren, New Jersey. These projects are conducted by a staff of twenty chemists and engineers under the direction of Dr. MacMullen.

• New Ion Exchange Process

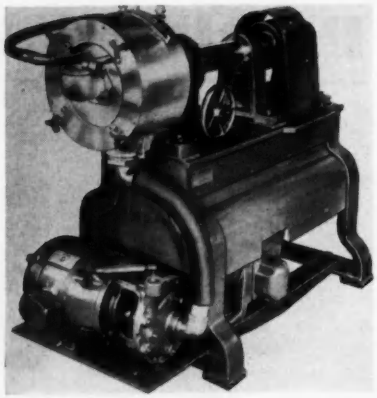
Water, containing less than one part of ionic solids per 100 million parts, can now be produced by passage through a mixed bed of Amberlite ion exchange resins, it is announced by the Resinous Products Division of Rohm & Haas Company. The new technique is said to permit complete removal of inorganic salts without deviation from chemical neutrality—pH 7.0.

Other asserted advantages of the new mixed-bed process include: reduced costs of both equipment and regeneration; lower rinse requirements; uniform performance in intermittent service; and a sharp breakthrough at depletion of the bed.

The mixed-bed system, according to the men who developed it, has several advantages over conventional two-bed ion exchange systems. In the mixed-bed process, the solution to be treated reportedly is passed through an intimate mixture of Amberlite IRA-400 (hydroxyl form) and Amberlite IR-120 (hydrogen form). Such a mixed bed may be regarded as a multiple-bed deionization unit consisting of an infinite number of cation and anion exchange columns arranged alternately in a series. IR-120 is reported to be a strongly acidic cation exchange resin capable of adsorbing metallic ions from solution while releasing an equivalent amount of hydrogen ions. IRA-400 is a strongly basic resin which splits salts in an exactly opposite sense: that is, it adsorbs the chloride, sulfate, carbonate and other anions from solution, releasing an equivalent amount of hydroxyl ions, it is stated. Thus, it is said that the intimate mixture of the two resins produces an effluent water essentially free of all ionized materials.

• Correction

In the January 23rd issue the second line of the news item entitled "New Fiber Softener" was inadvertently omitted in the printing. The line should be included to have the copy read "Zimmerman Associates, Chemists & Engineers, Guilford College, North Carolina, announce the installation of additional stainless steel equipment for the increased production of Zavel. . . ."



Tri-Homo Dispenser

• Tri-Homo Booklet

Tri-Homo Corporation, Rear 90 Highland Ave., Salem, Mass., has released a bulletin covering their homogenizers and dispensers.

The bulletin covers information relative to application of the products, sizes, production, weight, space, and auxiliary equipment. Illustrations and brief descriptions of several important features of the products are also included.

• ACC Publications

A guide to their complete line of resins, for use in surface coatings and printing inks, has been issued by the American Cyanamid Company, 30 Rockefeller Plaza, New York 20, N. Y.

Reportedly designed to aid the formulator in selecting the proper resin for his needs, the guide is said to be devoted to tabulating the physical and chemical properties of each of the coating resins manufactured by the company. These resins include Rezyl Alkyd Resins, Melmac Melamine Resins, Beetle Urea Resins, Cycopol Copolymer Resins, Phenac Phenol Resins, and Teglac Dibasic—Acid Modified Resins.

Publication of a revised edition of *"Products and Services of American Cyanamid Company for Industry and Agriculture"* has been announced by the firm. This 64-page illustrated book describes the products and services which Cyanamid offers to industry, agriculture and mining, and outlines the divisional structure through which such products are sold.

Copies of this new publication are available upon written request to the American Cyanamid Company, 30 Rockefeller Plaza, New York 20, New York.

• Record 1948 Output of Synthetic Organic Chemicals

The Tariff Commission, in its regular annual report on production and sales of synthetic organic chemicals and their raw materials, reports that production of synthetic organic chemicals in the United States in 1948 was 18.5 billion pounds—this was greater than the production of any previous year. Sales of these chemicals by their producers totaled 9.5 billion pounds, valued at 2.2 billion dollars, nearly half of the output being used by the producers for further processing. Production of tar and petroleum crudes from which the synthetic chemicals covered by the report are derived reached 23 billion pounds during the year.

The present report, the thirty-second issued on this subject by the Tariff Commission, is compiled from data supplied by 543 producing companies on about 6,000 individual items. It gives final statistics for 1948 on production and sales of all synthetic organic chemicals and lists the manufacturers of each. Included also in the report are data on United States imports of products entered in 1948 under paragraphs 27 and 28 of the Tariff Act of 1930, which cover coal-tar intermediates, dyes, medicinals, flavor and perfume materials, and other finished coal-tar products and, for the first time, the report includes a glossary of synthetic organic chemicals.

This report comprises three major sections—chemical raw materials, cyclic intermediates, and finished chemical products. Finished products are further classified according to their major use as dyes, lakes and toners, medicinals, flavor and perfume materials, plastics and synthetic resins, rubber-processing chemicals, elastomers (synthetic rubbers), surface-active agents, plasticizers, and miscellaneous chemicals.

Among the individual groups of finished products (cyclic and acyclic combined), which increased substantially in volume of output in 1948 compared with 1947, were surface-active agents (29 per cent), miscellaneous chemicals (20 per cent), plastics and resin materials (19 per cent); smaller increases were reported for lakes and toners, plasticizers, and flavor and perfume materials. Decreases, on the other hand, were reported for medicinals (12.0 per cent), dyes (5.2 per cent), rubber-processing chemicals (5.0 per cent), and elastomers (2.5 per cent).

Copies of the report, Synthetic Organic Chemicals, United States Production and Sales, 1948 Report No. 163, 2d Series) may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. at 40 cents per copy.

• National Cotton Week Dates

National Cotton Week will be held May 1 to 6 according to the sales promotion division of the National Cotton Council, sponsors of the event.

Extensive merchandising plans embracing all divisions of the industry are being prepared and will be announced shortly, it is reported. Cotton Week this year will emphasize promotions of cotton apparel, piece goods and home furnishings.

Comprehensive promotional material geared to current retail trends and merchandising procedures reportedly will be available to mills, converters, jobbers, garment manufacturers and retailers. Check-ups with representative retail organizations indicate a greater participation than ever before of all segments of the trade from cotton growers to retail merchants, and the cooperation of allied industries is being effected, the Council states.

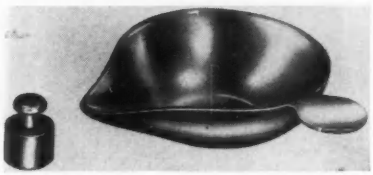
This year marks the first time that the National Cotton Council assumes complete direction of all Cotton Week activities.

• Spectrophotometry Booklet

Reliable spectrophotometric data is reported to be more easily obtained with the aid of a new booklet, *Spectrophotometry*, recently issued by the National Bureau of Standards, and made available from the U. S. Government Printing Office.

The techniques and data resulting from the Bureau's experience in spectrophotometry are said to be presented in this guide so that users of spectrophotometers can better understand their instruments, calibrate and maintain them in the proper operating condition, and guard against the numerous errors common in such work. Instruments and methods for use in the ultraviolet, visible, and near-infrared spectral regions are considered, including photographic, visual, and photoelectric methods. Important topics covered include definitions of spectrophotometric terms, essential parts of spectrophotometers, typical instruments in current use, types of errors which usually occur in spectrophotometric work, and presentation of standard data for checking the calibration of spectrophotometers. In addition, a bibliography of 127 related references is given.

Circular 484, *Spectrophotometry*, by Kasson S. Gibson, 48 large double-column pages, illustrated, is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., 25 cents a copy. Remittances from foreign countries must be in United States exchange and must include an additional sum of one-third the publication price to cover cost of mailing.



Ohaus Scoop and Counterweight

• Analytical Balance Scoop and Counterweight

Ohaus Scale Corporation of 10-14 Hobson St., Newark 8, New Jersey, announces the availability of its new Analytical Balance Scoop and Counterweight, both of which are made of aluminum to eliminate buoyancy errors due to air density variations. These scoops are available in both 10 and 30 milliliter sizes, and the sets list for $2.00 and $2.25, respectively.

These new Analytical Balance Scoop and Counterweight Sets are reported to be precisely balanced for use in the finest analytical work. Because both the Scoop and the Counterweight are made of aluminum, the balance remains constant, unaffected by air density changes, which can introduce large buoyancy errors when the Scoop and Counterweight are made of dissimilar metals, it is stated.

The 10 milliliter scoop measures 7/16 of an inch deep, 2 inches in overall length, and weighs about 4.5 grams. The 30 milliliter scoop is ¾ of an inch deep, 3 inches in overall length, and weighs about 13 grams. For convenience, the Scoop is made with a long pouring spout and handle. Both the Scoop and Counterweight are finished to a high polish and each set is serialized with corresponding numbers for easy identification where more than one set is being used. The box in which each is packed fits an analytical balance drawer.

For additional information about the product, write to the Ohaus Scale Corporation.

• New Metal Cleaning Publication

"A.S.T.M. Metal Cleaning Bibliographical Abstracts (1893-1949)" (Special Technical Publication No. 90) makes available information on a subject which should be of interest to those concerned with metals and their surfaces and cleaning.

The publication has been made possible by the intensive efforts of Jay C. Harris, Monsanto Chemical Co., who is now the Secretary of A.S.T.M. Committee D-12 on Soaps and Other Detergents. The task of organizing the data concerning metal cleaning was reportedly initiated by Mr. Harris and Robert B. Mears, Carnegie-Illinois Steel Corp., in 1943, the early work being concentrated on aluminum cleaning. Subsequent issues of *Annotated Bibliography of Aluminum Cleaning* were made and eventually other metal cleaning work was covered and supplements issued. With interest in the subject definitely on the increase, it was felt a more systematic treatment was desirable and Mr. Harris is reported to have consolidated all the previous material, added a large group of additional references, and prepared four helpful indexes: Subject, Author, Specification, and Patent.

The references are said to be arranged first by year and then by author, and they are numbered consecutively with specific numbering sequence. There reportedly are almost 500 references and abstracts. It is stated that as far as possible original articles have been abstracted, but some material is reabstracted from other journals.

Copies of this 72 page publication, heavy paper cover, can be obtained from American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., at $2.75 each.

• 14 to be Awarded Sloan Fellowships

Fourteen young business executives, largest group in the thirteen-year history of the executive development program of the Massachusetts Institute of Technology, will be awarded Sloan Fellowships in 1950, it was recently announced.

These fellowships, awarded to outstanding young executives in a nationwide competition, are said to cover a year of advanced study in economics and business administration at the Institute and are aimed at preparing men for higher executive responsibility.

The fellows will be drawn from both large and small companies in various types of industry throughout the country, it is stated, and the winners of the fellowships will participate in a special program consisting of seminars, classes, and field investigations aimed not only at increasing technical managerial skill, but also at deepening their understanding of the social and economic implications of their work. They will study in the Institute's departments of business and engineering administration and economics and social science, and will have an opportunity to conduct a special investigation in some selected field of industrial activity such as finance, production, distribution, or labor relations, the announcement stated.

Applications for the awards must be made by February 24. Recipients will be selected on a competitive basis by M.I.T. after consideration of the applicants' records and references, and consultation with their employers. Awards range up to $2700 for single men and up to $3700 for those who are married. Fellows will be in residence at the Institute in Cambridge from June 9, 1950, to June 10, 1951. Applicants must be between the ages of 30 and 35 and have at least five years' industrial experience, part of it in an executive capacity.

In discussing qualifications of successful candidates, Professor Gerald B. Tallman, director of the program, said: "Managerial ability, seasoned intellectual capacity and a sensitivity to the social and civic implications of industry, as well as a high potential for industrial leadership are the primary qualities upon which selection will be made.

"In addition, candidates must be graduates with good academic records from an accredited college or university. A majority will be graduates in science or engineering. The men will be on leave-of-absence from their companies and must have the enthusiastic support of their employers."

The original Sloan Foundation grant for these fellowships was made in 1938 as part of a program to promote "the increase and diffusion of economic knowledge."

There are 47 past recipients of M.I.T. Sloan Fellowships, among whom are ten current fellows who will complete their studies in June. As evidence of the program's breadth of coverage, the current group represents such varied companies as Corning Glass, Pratt and Whitney, Johnson & Johnson, Ford Motor, Illinois Bell Telephone, Richmond Engineering, Goodyear, National Gypsum, RCA, and Standard Oil of California.

• General Dyestuff Personnel News

General Dyestuff Corporation has announced that A. S. Hamilton, having reached the retirement age, retired January 1. They have also announced the appointment of W. A. Lord as the new Providence Manager. Mr. Lord, who was formerly Assistant Manager, assumed his new duties January 1.

• New Drycleaning Detergents

Alrose Chemical Co., 180 Mill St., Cranston 5, R. I., has introduced two new drycleaning detergents, Alrolene 65 and Alrolene 70. In conjunction with their release, Alrose has prepared a technical bulletin called "Some Frank Questions and Answers About the Alrolenes". The bulletin may be obtained by writing to the Alrose Chemical Company's Providence, R. I. address—Box 1294.

• American Polymer Bulletins

A series of ten Polysize Emulsions used as raw materials for compounding finishes for cotton, rayon, silk, nylon and linen are described in detail in Bulletin P-5, now available from the American Polymer Corporation, Peabody, Massachusetts.

The Polysize Emulsions described in the bulletin are free-flowing dispersions said to be easily diluted in water and readily adapted to all common methods of finishing textiles—padding, tumbling, spraying, and knife and roller coating. Long shelf life, extremely fine particle size, mechanical and heat stability are among the advantages which have made Polysize Emulsions popular for such finishing operations as permanent starching, bodying, dulling, weighting, and size and snag resistant finishing, it is stated.

Included in the bulletin are descriptions of methods used in applying the emulsions, formulas and finishing procedures and characteristics of the finish imparted.

"Polyvinyl Acetate Emulsions" and "Polyvinyl Acetate Solutions" are the titles of two new bulletins. These bulletins are said to represent one of the most comprehensive surveys of the industrial application of polymeric and copolymeric vinyl acetates ever offered.

Technical Bulletin P-16, entitled "Polyvinyl Acetate Emulsions," includes sections of the theory of emulsions, properties, compounding, uses, and storage and handling. Nineteen explanatory charts, graphs and illustrations accompany the 32-page text. Formulations recommended by APC for wood glue, bookbinding adhesives, compounding adhesives, emulsion paints, artificial leather and many other applications are analyzed in detail. Thickeners, solvents, buffers, modifiers, extenders, etc., are discussed and their effects on various formulations shown.

"Polyvinyl Acetate Solutions", Technical Bulletin P-15 contains a review of the forms, properties and uses of polyvinyl acetate manufactured by the solution polymerization of vinyl acetate at high concentration in a variety of solvents. The informative material in the bulletin includes sections on the uses of these solutions as adhesives, paper coatings, saturants, sizing, inks, lacquers, protective coatings and hot melts; lists of the solvents, diluents, modifiers, plasticizers and other addends which are recommended; charts, diagrams and illustrations which complement the text material.

All of these new bulletins may be had by writing, on business letterheads, to the American Polymer Corporation, 101 Foster Street, Peabody, Mass.

• FDC Wool Symposium

Under the auspices of the Textile Institute of Fairleigh Dickinson College, Rutherford, New Jersey, a Wool Symposium was held at the college on Monday evening, January 9, 1950. The Wool Bureau, Inc. of New York City furnished a program of speakers, color films, and a women's fashion show.

This is the first general exhibit on Textile subjects sponsored by the Textile Institute; another meeting is planned for the second semester on the new synthetic textiles.

Students of the Raw Materials class of the Institute prepared a large collection of textile raw materials from many countries for public showing in connection with the Symposium.

Carrying out the theme "Wool in the U.S.A.," the program included the following:

Opening Remarks—R. H. Mauersberger, Director, Textile Institute, Fairleigh Dickinson College.

"Your Interests and Wool"—W. F. Fitzgerald, President of the Wool Bureau.

"Men and Mobs"—colored film showing sheep raising and shearing in Australia.

"After the Fabrics Leave the Mills"—F. Eugene Ackerman, Chairman of the Executive Committee of the Wool Bureau.

"Men and Boy's Wear"—Alan Peek, Assistant Director of Information.

"Wool Fabrics in Women's Wear" illustrated by fashion show of spring fabric and silhouette trends—Jane Harvey, Coordinator of Women's Wear Merchandising.

"Wool Promotion and Education"—John Fulweiler, Director of Information, and his assistant, Betty Tanner.

"Scientific Research and the Future of Wool"—Giles Hopkins, Director of the Department of Science and Technology.

• "Clena-form" Cleaning Agent

College Pharmacy Products, 251 Main St., Medford, Mass. has announced the development of a new product, Clena-form, used extensively for cleaning and lubricating boarder and preboarder forms in the finishing departments of the hosiery industry. The white, creamy liquid is said to remove dyes, dye color and resins from metals while the metals are hot. On cold metals it is reported to act as a lubricant, thereby eliminating waxing and polishing.

Clena-form is non-inflammable, nonvolitile, contains no dangerous chemicals and is easy to use, the company states.

Clyde W. Gray

• Stowe-Woodward Promotion

Embert W. Peterson, President of Stowe-Woodward, Inc., Newton Upper Falls, Massachusetts, manufacturers of rubber covered rolls, has announced the appointment of Clyde W. Gray as Executive Vice President.

Mr. Gray, an engineering graduate of University of Kentucky, is reported to have a wide range of experience and accomplishment in the manufacturing and management fields. He comes to Stowe-Woodward, Inc. directly from his most recent connection with Ford, Bacon & Davis, industrial and management engineers, for whom he not only served a large industrial clientele, but also functionad as General Manager of their Atomic Bomb Operation at Oak Ridge, Tennessee in 1944 and 1945.

• Folder on Temperature Regulators

A 6-page folder describing construction and operation of the Type E2T100 temperature regulator is available from Spence Engineering Company, Inc., Walden, New York.

The folder contains illustrations showing how the regulator is adapted for storage heaters and instantaneous heaters. The product is said to vary steam pressure in definite steps with very small temperature changes at the thermostat bulb.

Also explained are these characteristics: Fast change in rate of heat transfer when load variations occur, dead-end shutoff when load ceases and no steam is required, and no stuffing boxes to maintain.

The folder also is said to describe how the regulator constantly resets itself in a positive, step action as the result of minute changes at the thermostat bulb. This reportedly controls steam flow into the heater in proportion to the demand. Because pressure rises or falls as load changes occur, rapid variation in rate of heat transfer are claimed possible.

• Folder on Dynel

Dynel, the newest synthetic fiber, is the subject of a 6-page folder issued by Carbide and Carbon Chemicals Corporation, 30 E. 42nd St., New York 17, N. Y. Properties, textile characteristics, and suggested applications are given.

Dynel is a staple fiber spun from a copolymer of acrylonitrile and vinyl chloride. The name, which is pronounced *di-nell'*, distinguishes it from the older "Vinyon" yarns developed by Carbide. The fiber is said to be strong, warm, and quick drying. It reportedly has good dimensional stability and is acid- and alkali-resistant. Dynel will not support combustion and is completely moth- and mildew-proof, it is stated. It is further stated that it can be dyed with either acid- or acetate-type colors and is easily processed on cotton, wool, worsted, or silk systems.

Dynel is currently available in semi-commercial quantities at $1.25 per pound. It is supplied in filament sizes of 2, 3, 6, 12, and 24 denier and in staple lengths of 1⅜, 1½, 2, 2½, 3½, and 4 inches. New dynel production facilities are being speeded to completion and are expected to be in operation sometime during the second quarter of 1950.

Copies of the descriptive folder may be obtained without charge by writing to Carbide and Carbon Chemicals Corporation. Ask for F-7427.

• Delaney Appointed Executive Director

Appointment of Ward Delaney of Charlottesville, Va., as executive director of the Oscar Johnston Cotton Foundation has been announced by William Rhea Blake, executive vice-president of the National Cotton Council and member of the Foundation's board of trustees.

With the appointment of Mr. Delaney, Mr. Blake also announced that the Foundation's board had set as its goal the establishment of a ten-million dollar fund which will serve to implement the cotton industry's goal of increased cotton markets.

Established in 1948 in honor of Oscar Johnston, Scott, Miss., founder of the Cotton Council and president of the organization from 1939 to 1948, the Foundation will seek to achieve its goal through education, research and development, it is stated.

The new executive director of the Foundation is a native of New Orleans. Mr. Delaney studied law at Tulane University and served as an Army officer during both world wars.

He has done research and production work for the oil industry in Louisiana and Texas and was connected with the Institute of Paper Chemistry at Appleton, Wisc. He comes to the Oscar Johnston Foundation from the Institute of Textile Technology at Charlottesville, Va., where he has served as president since the organization's charter was granted in 1944. Mr. Delaney's resignation from the Charlottesville institution becomes effective June 1, 1950, but through a leave of absence granted by the board of trustees, he will take up his duties with the Foundation immediately.

• Emtec Research Laboratories Organized

Organization of Emtec Research Laboratories in Stamford, Conn. for the purpose of product testing and product development has been announced by Dr. Samuel Machlis. The laboratories will be under the direction of Edwin B. Michaels. Dr. Machlis and Mr. Michaels were formerly co-directors of the product testing and institutional research program carried on for the American Hotel Association by York Research.

• Emeryville Chemical Changes Name

The name of the Emeryville Chemical Company, which operates a silicate of soda plant in Emeryville, Cal., has been changed to Diamond Alkali Company of California, effective immediately.

H. S. Bauer, general manager of the plant, made this announcement explaining that under the new name the company will continue as a wholly-owned subsidiary of Diamond Alkali Company, Cleveland, Ohio.

The Emeryville plant is one of 12 manufacturing units which produce alkalies and related chemicals for Diamond Alkali throughout the nation.

The local plant, in operation since 1919, was purchased by Diamond in 1944 it is stated. Diamond reportedly has six such plants making silicate of soda and related alkalies—products which are used in manufacturing laundry soaps and washing compounds, as adhesives in producing corrugated fiber boxes and plywood, in certain textile-processing and paper-manufacturing operations, and in the manufacture of silica gel catalyst for the oil industry.

Mr. Bauer stated that no changes are anticipated in personnel or policy matters.

• Bulletin on Injuries and Accident Causes

The United States Department of Labor's Bureau of Labor Statistics has issued Bulletin 962, "Injuries and Accident Causes in Textile Dyeing and Finishing." This report contains a detailed analysis of where, how, and why accidents happen in the textile dyeing and finishing industry.

Copies of this bulletin may be secured from the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. at 45 cents per copy. Remittance may be made either by coupons sold in sets of 20 for $1.00, and good until used, or by check or money order payable to the Superintendent of Documents.

• NBTI Grade Changes For Personnel

Following a recent meeting of the Board of Trustees of the New Bedford Textile Institute, the announcement of the advancement in grades of members of the institute faculty was released by President George Walker. President Walker issued the following statement,

"In compliance with established requirements for colleges granting degrees as follows:

Bachelor of Science in Textile Engineering

Bachelor of Science in Textile Chemistry

Bachelor of Science in Machine Design

reallocations in our administrative staff and faculty were made as follows:

George Walker, from Principal to President.

John E. Foster and Francis Tripp from Head Textile School Instructors to Professors.

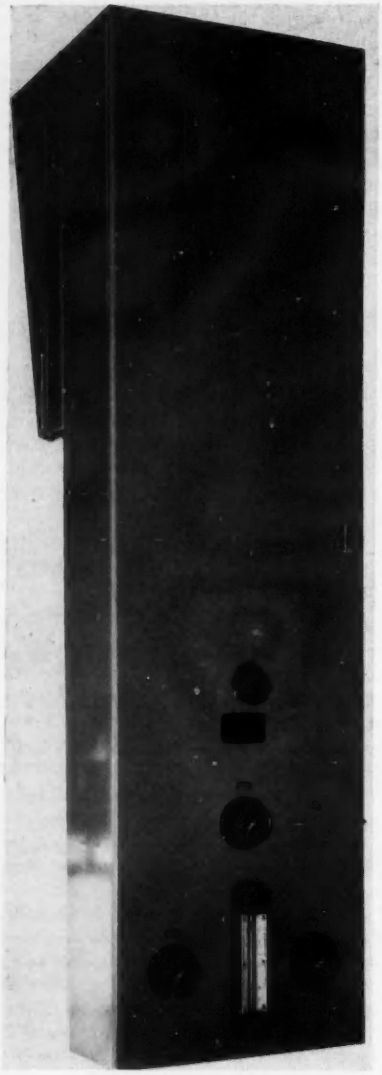
Fred Beardsworth, Edward H. Cloutier, James L. Giblin, Thomas H. Gourley and Frank Holden, from Head Textile School Instructors to Associate Professors.

John C. Broadmeadow and Edmund J. Dupre, from Textile School Instructors to Associate Professors.

Adam Bayreuther, Louis Pacheco, Jr. and Antone Rodil, from Textile School Instructors to Assistant Professors."

• Owens-Corning Publications

"Testing Methods and Facilities Used on Fiberglas Products," a new 36-page publication describes the facilities and procedures employed by Owens-Corning Fiberglas Corporation in its testing laboratories at Newark, Ohio, and Ashton, Rhode Island, to provide its customers with accurate data on the properties, uses and performance characteristics of Fiberglas materials in their various forms. The publication is illustrated with numerous photographs showing laboratory personnel operating the testing facilities. Copies may be obtained from Owens-Corning Fiberglas Corporation, Toledo 1, Ohio.



Builders Chlorinizer

• Chlorine Feeder for Industrial Applications

Builders Chlorinizer for feeding chlorine gas, a product of Builders-Providence, Inc., Providence, R. I., has been designed with special attention to insure safe and highly accurate operation, the company states. It is further stated that it has been thoroughly field tested and numerous industrial installations have been made.

Chlorinizers are said to meter chlorine gas, produce closely controlled concentrations of chlorine water solution for process use and improve control of slime and mussel growth. A positive and accurate chlorine rate indicator with direct reading linear scale reportedly assures equal ease and accuracy of readings at all rates. Maintenance due to corrosion is claimed to be reduced to a minimum because chlorine is controlled and metered in the dry, inert state. The feeder is reported to be readily adapted to semi-automatic, program or automatic proportional operation. Conversion from one method of operation to any other may be made in the field, it is stated. Bulletins are available.

• R.I.S. Issues Synthetic Fibers Bulletin No. 41

A new Research Bulletin listing translated reports on German research and development in the field of synthetic fibers has been issued by Research Information Service, 509 Fifth Avenue, New York 17, N. Y.

The data offered reportedly originated from the Vereinigte Glanzstoff-Fabriken, the I.G. Farbenindustrie, Thueringische Zellwolle A.G and the Institute for Chemical Technology of Synthetic Fibers, Breslau, and include a large number of research papers, technical reports, and patent applications.

Studies regarding the characteristics of cellulose as they affect its processing into rayon are contained under the heading "Cellulose Processing." A simple theory of the viscosity of macromolecular solutions in extreme dilution, based on the concept of variable ball shape, is discussed in one of the reports by J. J. Hermans, Utrecht (RIS Report No. 5859, $23.50). Other reports describe methods for determining air in viscose, and for maintaining the reactivity of cellulose for esterification, and for determining the density and refractivity of cellulose in dry state.

I.G. Farben processes for preparing synthetic fiber-forming materials are enumerated in the second part of the Bulletin. One of these processes deals with polyamides which yield fibers with higher melting points, higher moduli of elasticity and greater resistance to acids than conventional polyamide fibers (RIS Report 5868, $8.25); others relate to various starting materials for polyamides, and to polyureas and polyurethans.

The section entitled "Spinning and Finishing" comprises 24 reports concerning processing steps ranging from extrusion of fibers to dyeing of fabrics. A new apparatus for measuring strength and elongation of individual fibers, which incorporates a number of important advantages, is described in RIS Report No. 5878, ($19.50). Processes for manufacturing and finishing acrylonitrile fibers form the subject matter of RIS Reports 5883 ($3.25) anl 5889 ($4.00). Other fibers dealt with include viscose and cuprammonium rayon, polyamides, and glass fibers.

German methods for finishing rayon fabrics are exhaustively detailed with many illustrations in an American team report by the Technical Industrial Intelligence Committee (RIS Report No. 5229, $7.50), and a full translation of a voluminous research report on processing of rayon staple on the cotton system, prepared at the famed Zellwolle Lehrspinnerei Denkendorf, is given in RIS Report 5225 ($15.00), which includes 58 illustrations.

An abstract or a table of contents is given for each of the reports listed. For a free copy of Bulletin No. 41 or information regarding any other foreign technical data write to Research Information Service, 509 Fifth Avenue, New York 17, New York.

• U. S. Rubber Purchase

United States Rubber Company has purchased the Chemicals division of The Glenn L. Martin Company, according to a joint announcement by the two companies. The rubber company reportedly will acquire all assets of the division, including the Marvinol vinyl resin plant at Painesville, Ohio, laboratory equipment in Baltimore, patents and the trade name Marvinol. The purchase price was not announced.

The business will become a part of the Naugatuck Chemical division of the rubber company, it is stated, while the Painesville plant will continue to make Marvinol vinyl resin for sale to manufacturers of plastic products.

Through the sale of its Chemicals division, the Martin Company completes its program of concentration in the aviation field, by divesting itself of all interests not directly concerned with the manufacture of airframes, special weapons and closely related products, it is stated.

United States Rubber Company said the purchase is part of a long-range program to expand its activities in the chemical field.

The plant at Painesville, built in 1947, currently employs about 200 persons, with a monthly payroll of $50,000, it is reported. Consisting of nine buildings, it is said to be the third largest vinyl plant in the country, and the most modern of its type. It is close to raw material sources and has good rail, highway and water transportation facilities, it is stated.

The present management at Painesville reportedly will continue in charge. Employees on the Martin payroll were transferred to the rubber company's payroll at the end of the year, it was announced.

The operation is said to include about 65 employees in Baltimore connected with research and development, sales and technical service. It is planned to transfer Baltimore personnel to the Naugatuck Chemical plant, Naugatuck, Conn., this year.

Chandler T. White

• White Elected General Aniline V-P

Election of Chandler T. White as Vice President of General Aniline & Film Corporation has been announced by Jack Frye, President of the Corporation. Mr. White, a career man of 30 years' service with the organization, has been General Manager of the General Aniline Works (dyestuffs) Division of the Company and will also continue in that capacity.

A graduate of Dartmouth College in 1916, Mr. White took post-graduate courses at the Massachusetts Institute of Technology and served on the faculty there as a chemistry instructor for three years before joining the General Aniline firm as a research chemist at its Grasselli, N. J., plant in 1920.

Mr. White transferred to the General Aniline dye and intermediate manufacturing plant at Rensselaer, N. Y., the same year, and advanced to superviosry positions in the various departments until he was appointed Rensselaer plant manager in 1942. In September, 1947, Mr. Frye elevated him to the post of General Manager of the Works Division, placing him in direct charge of all the Company's operations in the dyestuffs and related fields.

A resident of Albany, N. Y., for many years, Mr. White now makes his home in Manhattan.

• Heyden Chemicals Supplemented

Heyden Chemical Corporation, New York 1, New York, has announced four more new products which will be of interest as intermediates to the industrial and scientific fields. These materials will supplement the first group of four, which were announced recently.

The products are Benzilic Acid and Para-Benzyl Phenol, which are now commercially available, and Benzil and Benzoin, which can be obtained in pilot plant quantities. Technical bulletins and samples are available to interested organizations.

• "Textile Chemicals" Published

"Textile Chemicals," a booklet describing the various specific processing uses of the products developed by the textile research department of American Viscose Corporation in conjunction with the Atlas Powder Company, has been published by Avisco for the use of throwsters, spinners, knitters, weavers, dyers, and finishers.

The booklet is divided into two parts, the first telling of lubrication, softening and static control in fiber, yarn and sewing thread processing by the use of Avcosol, Avcodisk and Avcosew. The second part is devoted to yarn sizing for knitting and weaving by the use of Avconit and Avcosol.

Avisco sells, services and distributes the line, which is manufactured by Atlas.

• Bocon Sales Plans

Ernest J. Conway, President of Bocon Chemical Corporation has announced a move to sell Boconize guaranteed mothproofing to the uniform industries. It was disclosed that Boconize has been adopted by "Uniforms By Oswald, Inc.", of Staten Island, N. Y. and Stanbury & Co. of Kansas City, Mo.

The woolen and worsted industry is showing an increasing interest in mothproofing, it is stated. According to Mr. Conway, their company sold more mills, and manufacturers in the first twenty days of December than in any other month of 1949.

Bocon contemplates spending approximately $200,000 in trade and consumer advertising during the coming year and expects to have the Boconize story told or mentioned in more than $3,000,000 worth of advertising space by mills, manufacturers, and retailers, it is stated. Their planning board estimates that an average of 2,000,000 yards per month of woolen and worsted fabrics will be Boconized during 1950.

• Bulletins on Asch Levlocator

The Levlocator, an automatic manometer for precisely determining the height of a liquid column, is described in two bulletins published by the Asch Equipment Company, 98-11 Queens Boulevard, Forest Hills, N. Y. Information on the product, which is said to indicate height at a local or remote station to 1/100 of an inch, is included under the topics of how it works, how it is applied, the indicator, and range and size.

These bulletins are available by writing to Asch Equipment Co.

• Color Manual for Industry

A Color Harmony Manual, based on the Ostwald System of color notation and color harmony building, is now on sale at H. G. Daniels, Artists' and Drawing Materials, Los Angeles. This manual is published by the Container Corporation of America. It is said to fulfill every requirement of the commercial and fine arts colorist. It is also said to be an invaluable tool for artists, decorators, painters, dyers, color manufacturers and other industrial users, who require a standard of exactitude in color.

The manual has 943 separate colors on hexagonal color chips which are removable for matching with materials, papers, paints, etc. Each chip is reportedly made by spraying a mat pigmented lacquer on one side of a cellulose acetate blank. This gives the user two conditions of the same pigment for comparison with materials of different textures. The cellulose surface furnishes the double reflection effect of glossy lacquers and other pigments of that type.

A complete text reportedly accompanies each manual with illustrations which explain the theory of the Ostwald System of Color Notation in detail, as well as the methods of discovering harmonious color combinations through its use.

H. G. Daniels, Artists' and Drawing Materials Dealer, at 621 South Grand Ave., Los Angeles 14, will send descriptive literature and answer inquiries upon request.

• Drew Boiler Water Treatment Booklet

A booklet covering the Drew System of Complete Boiler Water Treatment is available from Power Chemicals Division, E. F. Drew & Co., Inc., 15 East 26th Street, New York 10, N. Y.

This booklet describes the methods required to assure complete water treatment and includes photographs of each step in the process. It covers the various aspects of both chemical and organic treatment.

• "Integrity in Analysis"

Skinner & Sherman, Inc., Chemists and Engineers at 246 Stuart St., Boston 16, Mass. have issued literature entitled "Integrity in Analysis". The material covered in the folder includes discussion of what S. & S. has to offer in skill, personnel, facilities, ethics, experience, etc. as well as listings of laboratory activities, generalized activities and specialized services.

The folder is illustrated showing company activities in research, chemistry, testing, biology and spectroscopy.

John A. Fanning

• Atco Appoints Fanning

John A. Fanning, formerly chief chemist at the Brunswick Worsted Mills, Inc. of Moosup, Connecticut, has been appointed to the sales staff of the Atlantic Chemical Co., Inc., Centredale, Rhode Island.

Mr. Fanning attended Brown University and the Textile School of the Rhode Island School of Design. His experience includes assignments with the Wyandotte Worsted Mill, Central Village, Connecticut and the Cranska Thread Company, Moosup, Connecticut. In public life, Mr. Fanning served in the Connecticut General Assembly representing the Town of Plainfield and remains active in the Boy Scouts of America organization.

Mr. Fanning's duties in his new post will include coverage of Atco's Canadian accounts and certain of their New England territories.

• Plastic Engineers Elect

Plastics engineers attending the 1950 Technical Conference of the Society of Plastics Engineers at the Hotel Carter in Cleveland elected new officers to represent the national society during the coming year.

C. Todd Clark, director of the Plastics Division of the F. Burkart Mfg. Co. of St. Louis, was named president, succeeding Mario J. Petretti of Holyoke, Mass. Islyn Thomas, president of Thomas Manufacturing Corp. of Newark, N. J., was elected vice-president. Robert L. Davis, sales engineer for the Continental Can Company of Cambridge, Ohio, has been named secretary. W. O. Bracken, Herchles Powder Co., will be treasurer.

The 1950 Technical Conference opened with many plastics engineers attending from all parts of the United States and Canada. "This is the largest conference attendance we have had in the history of the Society," Mr. Petretti said.

The conference features presentation of original research papers by twenty of the nation's top plastics experts.

• Smart Appointed Sales Engineer

Joseph F. Smart has recently been appointed Sales Engineer for Marshall & Williams Southern Corporation. He will travel throughout the South making his headquarters at the Greenville, South Carolina plant of the company (121 Welborn St.)

Mr. Smart has completed a training course at the parent plant of the company in Providence, Rhode Island, in the building, repairing and assembling of Marshall & Williams products, including tenter frames and tenter chains.

Mr. Smart is 28 years old and served as Flight Lieutenant in the Royal Canadian Air Force, Bomber Command, for four years. After completing his military service he entered North Carolina State College and graduated in 1948 with a BS degree in textile manufacturing. After graduation he went with Robbins Cloth Mills where he ramained until transferring to Marshall & Williams Southern Corporation, May 23rd, 1949.

• CCNY Lab Course in Testing

Men and women interested in working in the bureaus of standards and the testing departments of wholesale and retail organizations will be given an opportunity to gain a knowledge of the methods used in testing laboratories and to learn to evaluate reports on textile materials that have been tested by such laboratories in a new "Laboratory Course in Textile Testing" which will open at the Evening and Extension Division of the City College School of Business, New York, on February 14.

Instructors will be A. J. Burtsell, Assistant Professor of Chemistry at The City College, and Herbert D. Wojan, Textile Consultant.

• Riegel Promotions

Preston David, former Overseer of Dyeing in the Dyeing and Finishing plant at Trion, Georgia, has been promoted to Assistant Superintendent of Dyeing and Finishing, a unit of Riegel Textile Corporation Trion Division.

Mr. David, who has been employed by Riegel in Trion since 1939, is a graduate of the Georgia Institute of Technology.

Max Ferguson, former Assistant Overseer of Dyeing in the Dyeing and Finishing plant at Trion, succeeds Mr. David.

Mr. Ferguson, employed by Riegel in Trion since October, 1941, attended Hampden-Sydney College.

Both are members of the A.A.T.C.C., South Central Section.

Harry S. Thompson

• Supervisor Named For H-D Beta Naphthol Plant

Appointment of Harry S. Thompson as supervisor of the newly completed beta naphthol plant of the Hilton-Davis Chemical Company Division, was announced by James F. Thompson, Jr., divisional general manager and vice-president of Sterling Drug Inc.

The new supervisor began his career with Hilton-Davis as a student worker in 1930 while at the University of Cincinnati, and became a regular employee of the company upon his graduation in 1935.

• Riordan Named Hooker Treasurer

At a gathering of executives and department heads on January 13th, E. R. Bartlett, President of the Hooker Electrochemical Company, announced that Dennis A. Riordan had been elected Treasurer of the Company, effective January 15th, 1950, succeeding John F. Bartlett who retired as Treasurer and Assistant Secretary on December 1st, 1949.

A native of New York City, Mr. Riordan became associated with the Hooker Company in February 1924 as an accountant in their New York Office. In 1926 he was promoted to the position of Chief Accountant and was named Assistant Treasurer in January 1941.

Previous to his employment by Hooker, Mr. Riordan was employed by W. R. Hughes Inc., New York, N. Y., as an accountant. Prior to that he did accounting work for the U. S. Government and the Associated Press. He and his family moved to Niagara Falls in 1939 when the main offices of the Hooker Company were transferred from New York City.

• Stein, Hall Move Atlanta Office

Stein, Hall & Company, Inc. announce the removal of their Atlanta office to new and larger quarters at 80 West Peachtree Place, N. W., Atlanta, Georgia as of January 2, 1950. The telephone number remains the same as before—Alpine 1821.

SANDOZ PRESENTS *The color achievement of the month*

Petal Pink ...BY SPRINGFIELD

As sure of the "lastingness" of the color as it is of the wearability of the fabric . . . Springfield Woolen Mills calls this its "generation" blanket — and promises its customers: A generation hence . . . your first thought will be, "That was a grand buy!"

To maintain the reputation for the durability of its blankets, Springfield takes care to match its own resources with the finest possible supplies . . . and numbers among its suppliers, Sandoz, for dyestuffs of highest quality.

Sandoz colors which combine assurance of everlasting customer satisfaction with dye house economy include — for products like wool blankets — a line of fast-to-light milling colors such as Brilliant Alizarine Milling Blue BL (Pat.) and Levana, a protective and leveling agent for the dyeing of milling and chrome colors on wool.

Then there are Sandoz' exclusive Metomega Chrome Colors, which save time in checking formulas and in boiling; CUPROFIX, the new after-treatment which gives wet fastness to selected direct-dyed goods without the extra cost of vat dyestuff; and many others. So for any chrome, acid or direct dyes . . . or auxiliary chemicals . . . for both natural and synthetic fibres . . . be guided by the successful "color achievements" you see in these Sandoz advertisements.

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SANDOZ *thinks ahead with textiles*

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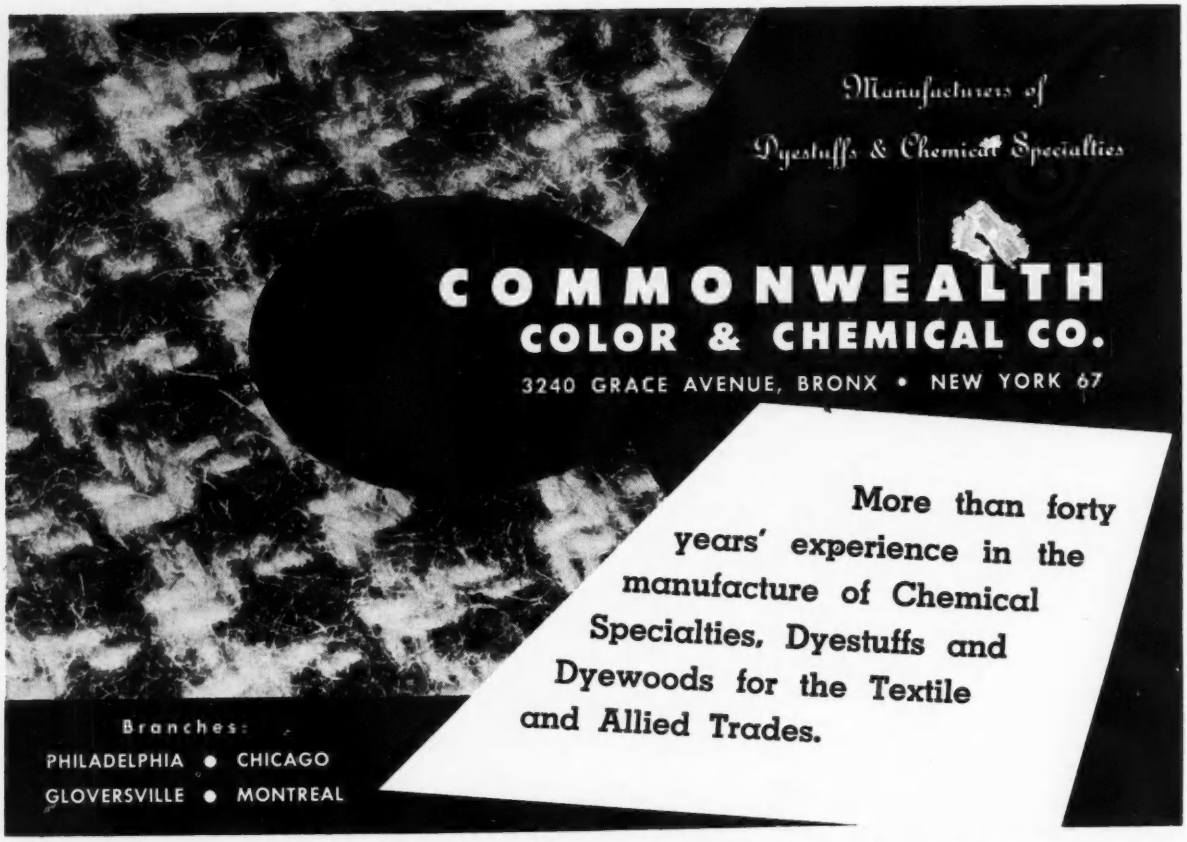

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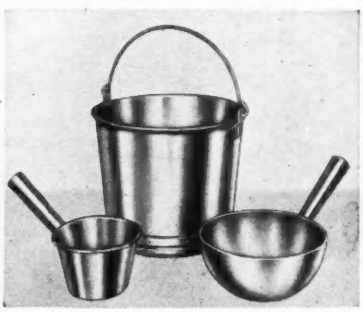

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Also full line of seamed and welded stainless steel and monel pails, buckets, dippers, funnels, measures, scoops, beakers, batch cans, etc., in stock.

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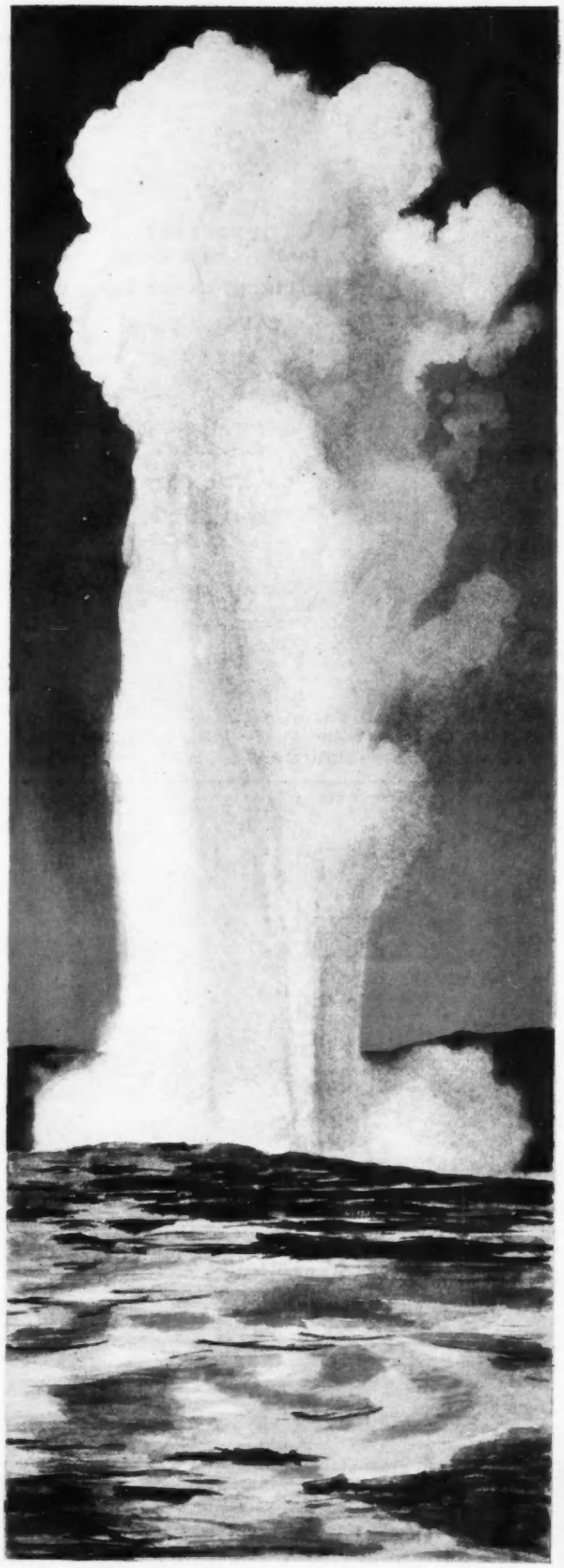

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Visitors to the Yellowstone can count on a regular performance every 67 minutes. They're never disappointed.

Good performance—free from uncertainty or disappointment—is always appreciated. Diastafor brand de-sizing agent—Type L—has a host of enthusiastic users because it can be depended on for the good results you demand in your finishing operations.

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They have made Diastafor the leader in its field because it has the qualities they need to keep finishing easy and trouble-free.

Diastafor will work efficiently and give good results in a wide range of temperatures and pH, which meets every enzyme de-sizing requirement. It has great flexibility of use . . . helps you meet the varied problems that arise with almost every lot, and makes de-sizing operations as nearly fool-proof as possible.

Yard after yard and mile after mile, you get the fine "hand" that is essential to a good finish, whether you are working with cottons, rayons, or mixed goods.

Bleachers and dyers have been counting on Diastafor for good performance for more than 40 years. A trial will show you that its leadership is well-earned. Please write us at this address for further information and prices. Standard Brands Incorporated, *Diastafor Department,* 595 Madison Avenue, New York 22, New York.

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Equally effective for rayon hosiery and mixtures, woolen and cotton yarns and piece goods, Laurel Triconates, powdered detergents, remove sizing and other foreign matter quickly, safely.

Produce clean, soft condition, assure level dyeing – clear shades. For hosiery, can be used in single or split-bath and in combination with other detergents. Laurel Triconates will cut your processing costs. Send for sample and recommendations.

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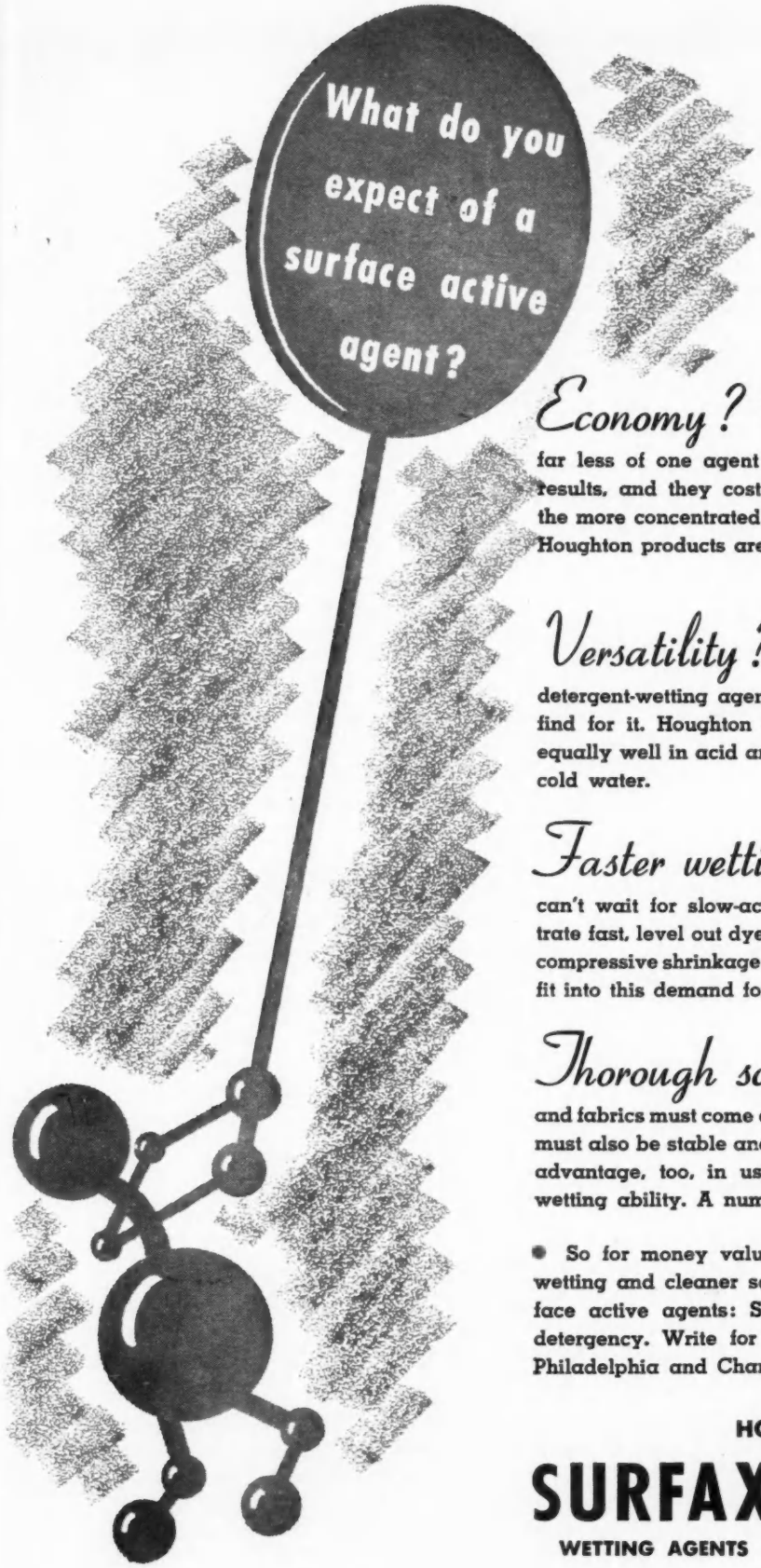

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The more jobs a single detergent-wetting agent can do, the more uses you will find for it. Houghton agents are versatile; many work equally well in acid and alkaline solutions, and in hot or cold water.

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Production lines can't wait for slow-acting agents. They've got to penetrate fast, level out dyeing rapidly, give speedy aid in the compressive shrinkage process. Houghton's wetting agents fit into this demand for speedier processing.

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Yarns and fabrics must come clean when using a detergent which must also be stable and not promote rancidity. There's an advantage, too, in using a detergent which possesses wetting ability. A number of the *Cerfak* series do.

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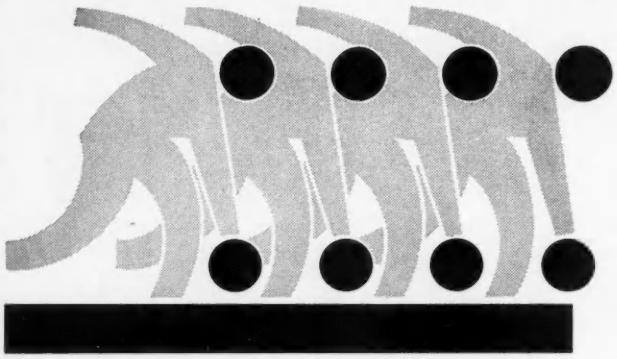
WETTING AGENTS **DETERGENTS**



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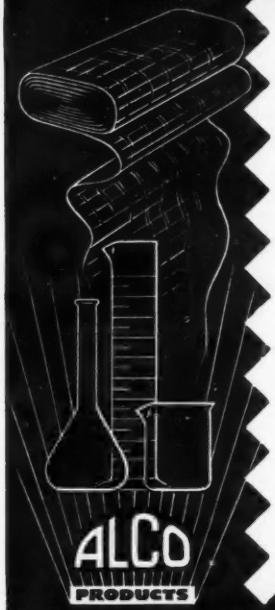

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SODIUM SULPHIDE FLAKES

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Other Na_2O (not oxidizable)	1.35
Na_2S	61.00

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for use in . . .

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FOR WOOLENS

A self-emulsifying oil specific for woolens. Applied direct or as an emulsion, Twitchell 7410 Wool Oil provides excellent lubricity at low cost, has no injurious effect upon fibres, removes readily with light scouring.

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A soluble-type oil completely dispersible in cold water. Applied as an emulsion only, Twitchell 7430 Oil provides all the qualities essential to efficient wool and worsted lubrication . . . aids in static control . . . non-gumming, non-staining even under severe mill conditions. Reduces costly waste in combing and carding. The most readily scourable oil available. In many cases no soap is required.

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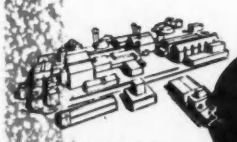
Emery's Emersol oleic acids are the most stable red oils available with lowest unsaponifiable content. Mackey tests show resistance to oxidation at least twice that of any commercial oleic acid with Emersol 233LL Elaine showing over 7 times the resistance.



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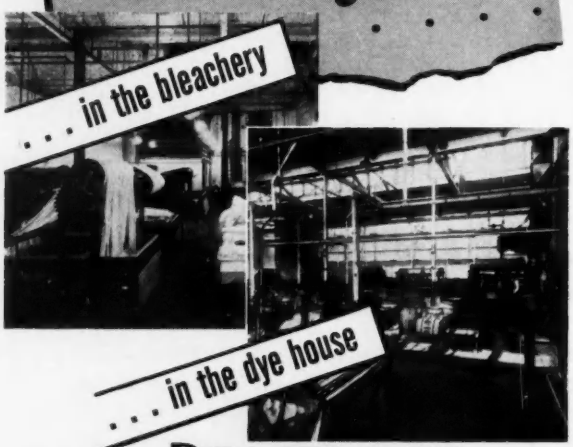

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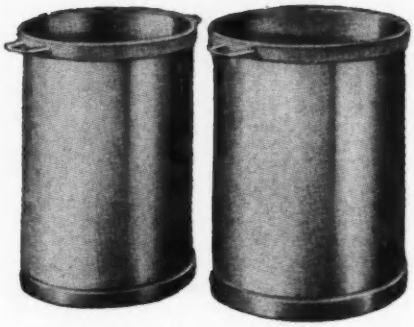

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15	15¾	18	27.00	33.00
20	16	24	30.00	39.00
25	18	24	37.50	45.00
30	20	24	45.00	51.00
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50	22¾	30	63.00	63.00
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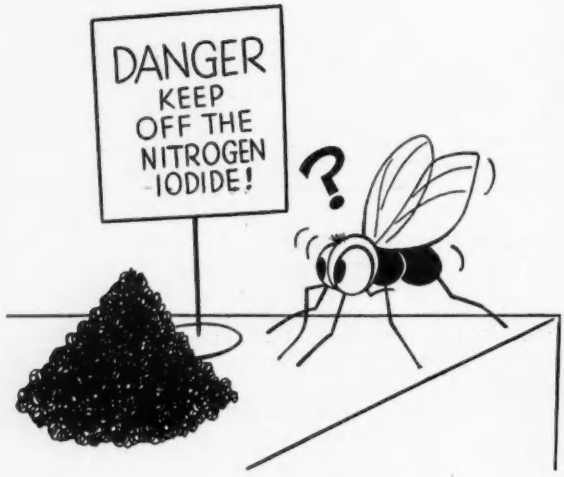

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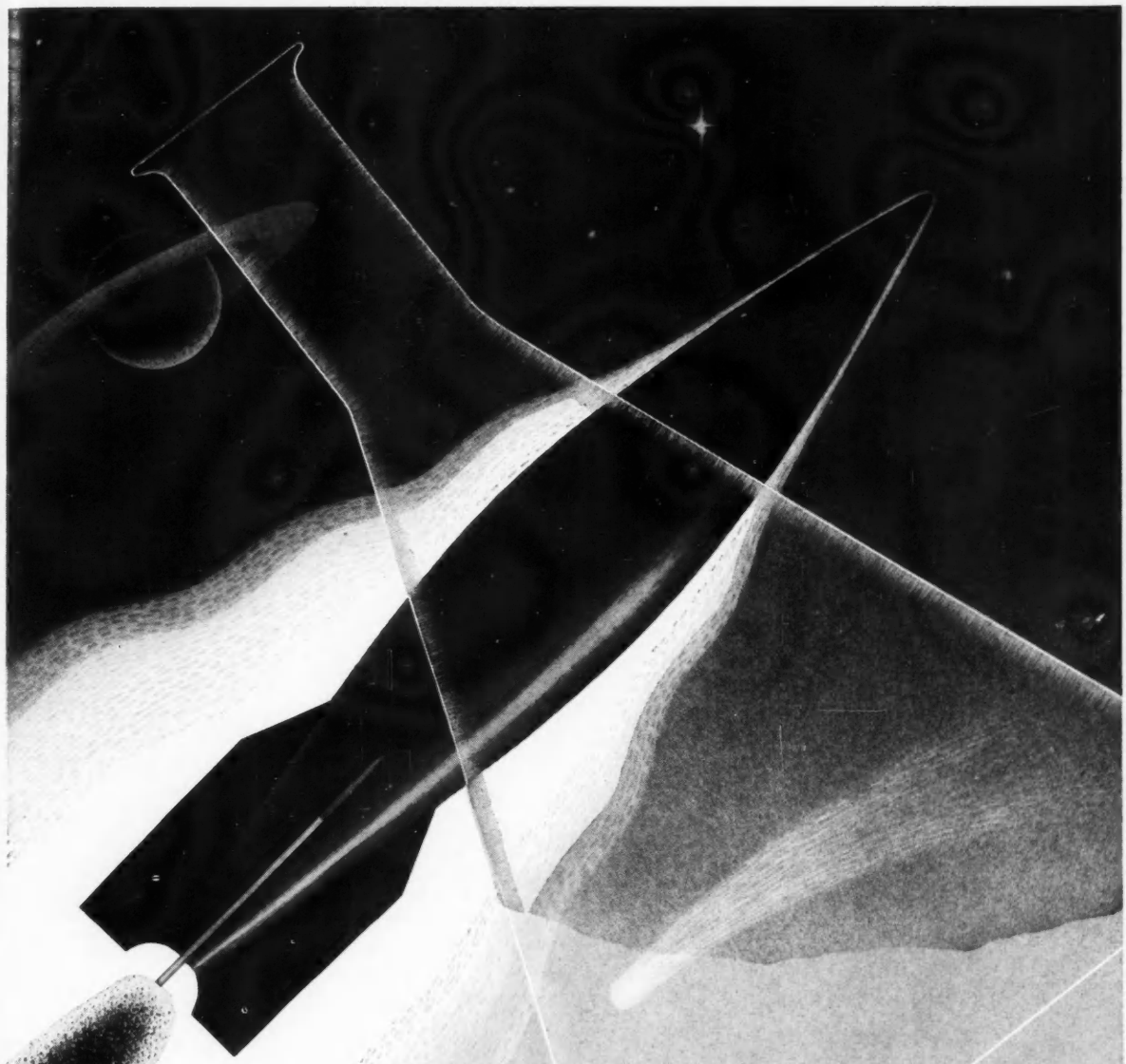

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